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FOOD MANUFACTURE

Vol. IX., No. 5 May, 1934

Advanced Dietists

IN OUR youth we were taught that man cannot live by bread alone, but according to some of our advanced dietists he ought to live without it entirely! When one hears the views of some of our food faddists it seems a remarkable fact that the race has managed to exist at all. According to many of these views, it should have extinguished itself centuries ago, instead of which it has developed itself mentally, as shown by the astonishing advances of science and art manifested in the discoveries of the last century, and physically, as shown by the waging of the biggest war the world has ever known and the herculean feats of endurance of airmen, explorers, athletes, and so on.

We remember hearing Dr. Jago at the Food Symposium, standing there a ruddy picture of health at eighty years of age, telling Professor Drummond and the rest of us how he had transgressed against every law of the dietists and just ate and drank what he liked. No doubt Dr. Jago agreed with Marie Lloyd, that a little of what you fancy does you good—probably a great deal more than the capsulated doses of vitamins and whatnots that are being foisted on people nowadays.

Cereals and Teeth

All this, by the way, is apropos of Dr. Mellanby's views on the deleterious effects of cereals on the teeth (Special Report of the Medical Research Council, No. 191, 1934). Dr. Mellanby suggests that in order to reduce the incidence of dental disease it is necessary greatly to increase the consumption of milk, eggs, cheese, animal and fish fats, and decrease or, in the case of the very young, abolish the consumption of cereals. Our learned friend may be right—who can say?—but we still believe that bread and cereals form an essential part of a *balanced* diet.

Dentists in Trouble

Unfortunately, there are always opportunists about who are ever on the alert to seize on points made in scientific papers, dress them up, and put them to illegitimate use for their own ends. One such case has come to our notice recently. A statement in an advertisement for a vitamin-containing product runs something like this: "The fact that the English are a toothless race at twenty-five years of age is due to the women being starved of vitamin B during pregnancy." What confounded hard luck on the dentists! What people say about the dentists making huge profits out of the manufacture of false teeth is true after all!

Bread Staling

We have frequently referred to the various views expressed on this very vexed question. Many workers have studied the problem and have arrived at different conclusions. One of the foremost workers in this field is J. R. Katz, and in a recent paper (*Z. ges. Getreide Mühlen u Backereiw*, 1934, vol. 21, p. 8) he has expressed his latest views. He maintains that there is no definite temperature at which staling begins and ceases, only a range of temperatures (25° C. to 50° C.) over which the change takes place. Bread keeps fresh at moderately high temperatures (above 50° C.) and only becomes stale at low temperatures. It is not permanently changed by heating; the staling is merely arrested and starts again on cooling. Katz's main point is that it is always possible to keep bread fresh, but it is not always possible to freshen it up again. Bread that has been "freshened up" by heating to 70° C. differs considerably more from fresh bread than bread which has been kept fresh at 70° C. He maintains that the staling of bread depends on the displacement of a physico-chemical equilibrium with temperature, and all fresh bread

is in a condition of unstable equilibrium at room temperature.

Disinfection of Dairies

Disinfectants of the hypochlorite class have recently been recommended for use in dairies to sterilise the utensils as well as the floors and premises in general. No one will wish to deprecate the disinfecting value of chlorine compounds, and for many purposes the use of sodium hypochlorite is most desirable. In the case of dairy utensils, however, its use may lead to awkward complications, as was pointed out by Elvidge in a recent paper to the North of England Section of the Society of Public Analysts. It is generally accepted that the presence of nitrates in milk is an indication of added water, and the diphenylamine reaction has been used as a means for detecting added water. There have, however, been certain cases of a positive diphenylamine reaction in "appeal to the cow" samples for which no adequate explanation has been forthcoming. As Elvidge points out, the diphenylamine reaction is not restricted to nitrates; substances of an oxidising nature, such as hydrogen peroxide and the hypochlorites, will also give positive results. The work now being discussed has proved that the addition of hypochlorites to milk with a negative reaction to diphenylamine or diphenylbenzidine brings about a positive reaction, and even one part in ten millions is just discernible. It is thus very important that dairy farmers should be careful in the use of chlorine disinfectants, as the presence of minute traces might lead to the suspicion of added water.

Achtung!

In the Milk and Dairies Order of 1926, Part V., paragraph 21, it is laid down in subsection 2 that no oxidising or preservative agent shall be used in the cleansing of any vessel or appliance, but a proviso is added that this shall not apply to mechanical milkers and similar appliances used in milking which are efficiently cleansed so that all trace of any substance used in the cleansing is removed before they are brought into contact with milk. To keep within the law, therefore, and to avoid unnecessary and unwarranted suspicion, dairymen who are using any disinfectants of the hypochlorite class should make sure that they have an absolutely efficient method of removing all traces of the disinfectant after the utensils have been sterilised. Fortunately, the hypochlorites are very soluble, and a good supply of fresh water should meet the case.

Potatoes

On another page we have given some observations on a report entitled "Problems of Potato Growing," just issued by the Rothamsted Experimental Station at Harpenden. This consists of a collection of papers recording investigations into the growing, diseases, and utilisation of potatoes.

A perusal of this report brings home the many difficulties of this important industry. It is an industry which is highly specialised and localised; indeed the bulk of the crop is produced in five well-defined regions.

Sir John Russell, the director of the Station, makes a plea for the establishment of a special Potato Research Station in one of the important potato-growing districts. The existing testing and demonstration stations serve a useful purpose, but a special research station in touch with these and with the large research institutes of the country would complete the scheme and undoubtedly prove of great value.

Potatoes as Food

The manufacturer will be chiefly interested in Dr. H. E. Woodman's discussion of the question of making use of excess potatoes on the farm. He examines the food values of the vegetable. Weight for weight, potatoes have rather more than twice the feeding value of swedes and mangolds. In the former the carbohydrate exists as starch, in the latter vegetables as sugar. But sugar has only three-quarters the fattening value of starch because sugar suffers more destructive fermentation by bacteria in the paunch of sheep and cattle than does starch.

Another interesting point is that potatoes are quite rich in vitamin C. They also contain small amounts of vitamins A and B. Vitamin potency is said to be only slightly reduced by cooking.

Power Alcohol

In a report of this nature, one naturally looks for views on the thorny question of manufacturing power alcohol from potatoes. Sir John Russell says that this matter has been carefully gone into and that the economies of several of the processes have been investigated. As one would expect from experience gained in the canning, beet sugar, and other industries which depend on local agricultural products for their supplies of raw material, the first big question to be settled is that of ensuring regular, ample supplies of potatoes to the alcohol factories, and "before they could be erected, farmers would

need to enter into contracts to supply definite amounts of potatoes each year, whatever the market price."

Alcohol from Maize

In this connection we have an interesting communication from Rhodesia to the effect that a new company with a capital of £70,000 has been floated in Southern Rhodesia to exploit the production of power alcohol from maize by the Merck process. To commence with it is proposed to erect a medium-sized plant with an average capacity of 960 gallons of alcohol per day. The estimated cost of production is 1s. 6d. per gallon. The dry residue from the process is stated to be a valuable, concentrated feed for cattle.

The Government of Southern Rhodesia has undertaken to ask Parliament for powers to enable it to make the use of power alcohol compulsory if the company or companies experience any difficulty in finding a ready market for their product, and provided that the retail price of the mixed fuel is not greater than the retail price of the straight petrol.

Byssoclamys Fulva

This is not the name of a Siberian railway station but of a mould which has suddenly sprung into the limelight as an agent of fruit spoilage on a scale that demands the very serious attention of every fruit canner and bottler in the country.

It was first brought to general notice by Miss M. Olliver and George Smith in 1933 (*Jour. Bot.*, 71, p. 196), and in the same year Professor H. Raistrick and G. Smith reported on its metabolic products (*Biochem. Jour.*, 1933, No. 6, p. 1814). On April 9 the economic significance of this mould was fully discussed by Miss Olliver and Mr. T. Rendle at a London meeting of the Society of Chemical Industry.

This was one of the most interesting scientific meetings we have ever attended, not only because it reported a new important agent of spoilage of preserved fruits, but also on account of the pleasure one derives from listening to an account of how difficult problems were tackled in the truly scientific manner and how these problems were solved one by one.

Much more will be heard of *B. fulva* in the near future.

Salmon Oil

It would be interesting to have the vitamin A potency of British salmon liver oils to compare with the values given by B. E. Bailey of the Fisheries Experimental Station, British Columbia.

Mr. Bailey found that of five species of salmon the oil richest in vitamin A contained forty times and the poorest twice as much of this vitamin per gram as a sample of cod liver oil stated to contain 500 A.D.M.A. units per gram. The oil content of the livers averaged 5 per cent., and the livers formed 2 per cent. of the fish.

Labelling Food

In last month's Editorial Notes we referred to the recommendations of certain American scientific societies on the question of labelling food. Since then a Departmental Committee in this country has drafted its report, and new legislation upon food qualities and food contents will probably be recommended. At the time of writing neither the report nor the text of the Committee's recommendations is available, but we understand that it is definitely in favour of new legislation. The object of this Committee was to consider " whether it is desirable that the law relating to the composition and descriptions of articles of food should be altered so as to enable definitions or standards to be prescribed, and, if so, to recommend what alterations of the law are required."

According to a *Times* correspondent, the report, which is unanimous, advises that Parliament shall empower the Minister of Health to make orders as to the contents and labelling of particular foods upon the findings of an Advisory Committee which, in every case, shall go into full consultation with the interests affected and shall hear evidence.

A Delicate Situation

This, we consider, is a step in the right direction, provided it is carried out with reason and in a manner not likely to interfere with production and distribution to any great extent. At present there are very few articles of food the sale of which is controlled by standard. The dairy products—milk, cream, butter, and margarine—appear to be the only ones, and there are undoubtedly many others of the vaguest composition and nutrient value, such as bread, jam, meat paste, egg powder, and custard powder, to mention but a few, that might come under definite control. The matter is, however, one of great delicacy, and obviously no legislation along the lines of a general rule can be satisfactory. Every case should be considered on its own merits. The Committee has taken evidence from forty associations of food manufacturers as well as scientific

societies, and is thus doubtless well aware of the difficulties of the situation.

Safer Milk

Since the movement to increase the sale of milk to the public was inaugurated there have been complaints by some producers of the unhelpful attitude of the medical profession. The producers feel that the repeated insistence upon the supposed dangers of milk is bound to prevent an increased consumption. As a result a very important meeting was held last month at the London School of Hygiene and Tropical Medicine, when the matter was discussed and a memorandum on the Government's milk policy was framed. This has now been presented to the Ministers of Health and Agriculture, and appeared in full in a recent issue of *The Lancet*. It is an important document, as all the seven signatories are authorities on various aspects of the milk problem, and they embrace the chemical, bacteriological, agricultural, and veterinary sides. The report restates the case against raw milk as a beverage, but goes on to make some practical proposals for the future solution of the present difficulties. They do not consider that raw milk, whatever its grade, can be regarded as altogether safe for human consumption.

Remedial Measures

It is claimed that low-temperature pasteurisation will render milk safe without impairing its nutritive properties. Under the present system of grading, milk supplies from tuberculin tested herds, and therefore presumably free from this infection from the cows, cannot be treated by pasteurisation. As a result the medical profession has no confidence in recommending it and the milk producers complain that the sale of this superior quality milk is not encouraged. The memorandum suggests that permissive powers be given to pasteurise such milk so as to make available a really safe, clean milk, and urges that it would justify the extra cost, which is estimated at not more than twopence per quart over that of ordinary pasteurisation, because, with the strong support of the doctors, a large market should be assured. The memorandum urges the establishment of a better standard of cleanliness for all milk before pasteurisation, and in addition the establishment of tuberculosis-free herds on a much wider scale than hitherto. The final word of the memorandum is: "The provision of a clean, safe milk supply is possible only if medical, veterinary, and agricultural interests are united in the support of a plan based on scientific knowledge. The time seems to us to be ripe for the translation of scientific knowledge into current practice."

Refrigeration Exhibition

We attended on April 27 the opening of one of the most interesting exhibitions we have ever been privileged to view. This is being held in the Science Museum, Exhibition Road, South Kensington, and continues till August. The Exhibition comprises a collection of models and food products to illustrate the historical development of refrigeration and its application to the food industries, including exhibits designed to illustrate the principles of spoilage by micro-organisms.

Visitors will, for instance, find a model of the cold storage quarters of a ship. There are also full-sized cold storage chambers of various types. An excellent model represents a modern large ice-cream factory, and alongside it is an ice skating rink. The brewery in another case is almost "life like," down to the smallest detail. Interesting and instructive also are the models of a milk cooling station, a margarine factory, a compound lard factory, and a bacon factory.

Fruit Storage

The above are, of course, familiar to food technicians, but what will be new to most is the model of a hop kiln which has been converted into a store for apples and other fruit in an atmosphere of carbon dioxide. The kilns are insulated with granulated cork and rendered gastight by lining with galvanised sheets smeared with vaseline. A fan circulates cooled air through the cases of fruit. Apples are wrapped in oiled paper. The proportion of carbon dioxide is regulated automatically by ventilation.

A Permanent Food Exhibition

It occurred to us that such an exhibition should be made permanent. Still better, we would urge that a permanent exhibition be instituted to bring home to the general public the causes of spoilage in foodstuffs and hence the necessity for ensuring hygienic conditions in the handling and storage of foodstuffs. Such an exhibition would rapidly establish itself as a national institution of incalculable value.

"Food Industries Manual"

We have pleasure in announcing the publication of the 1934 edition of the *Food Industries Manual*.

Food Congress in Paris

By H. B. CRONSHAW,
B.A., Ph.D., A.I.C.

Editor of "Food Manufacture" and Delegate of the Society of Chemical Industry.

Our impressions of the III^e Congrès International Technique et Chimique des Industries Agricoles recently held in Paris, together with reports on papers presented.
Above is a photograph of the Minister of Agriculture addressing the President of France (seated third from the left) and various Ambassadors and high officials at the opening ceremony.

THE THIRD International Congress of Agricultural and Food Chemistry (Congrès International Technique et Chimique des Industries Agricoles) was held in Paris from March 26 to 31. It was an impressive and very well-organised affair, well attended by chemists and government officials from all parts of Europe and even from America and Japan. It is stated that representatives of forty-three governments were present. Curiously enough, neither Britain nor Germany sent official representatives, an unfortunate omission which gave rise to much comment and, indeed, regret. This does not mean to say that there were no British visitors. For instance, Mr. Leonard Hill played a prominent part in the various proceedings throughout the Congress and participated in the visits noted below. Mr. Vernon Charley, from the Long Ashton Research Station, University of Bristol, presented several papers. Messrs. Pope and Langwell from the D.C.L. Research Laboratories at Great Burgh, Epsom, also took part in the proceedings. Dr. Kent-Jones presented a paper, but did not appear in person, and a paper on the waste waters treatment and disposal in Great Britain was presented by the Economic Advisory Council of the Department of Scientific and Industrial Research.

The first gathering took place on Sunday, when the Congressists took amiable stock of one another to the accompaniment of a charming little group of violinists. There was dancing and much talking, bowing, and a general exchange of pleasant greetings.

This was, however, merely by way of a preliminary to the real opening function which took place on Monday morning. At eleven o'clock all the members, numbering some 500 or 600, assembled in the magnificent hall of the Conservatoire National des Arts et Métiers to witness a most impressive inauguration ceremony in the presence of M. le Président de la République, MM. les Ministres des Affaires Étrangères, de l'Agriculture et du Commerce, et des Membres du Corps Diplomatique. Speeches were made, and these were interspersed with selections from a military band. Colour was supplied by a detachment of steel-helmeted dragoons in their red and white uniforms, standing at attention with drawn swords.

The President of the Association of Chemists, M. Fernand David, made an eloquent appeal for support of the national movement, inaugurated by this Congress, for the extended application of scientific research to the agricultural and food production industries. This was supported by an equally forceful appeal from the Minister of Agriculture (see photograph above). He said that there was a crying need at the moment for some means whereby the data obtained by the labours of French scientists would be made more directly available to industry, and that he confidently expected that this organisation would provide the means for achieving this object. It was evident from the applause accorded by M. le Président de la République and his Ministers that these remarks received the wholehearted sympathy of the Government.

The Congress, launched as it was in truly magnificent fashion, then sailed along merrily through the rest of the week, ending with another splendid flourish on Saturday evening, March 31, in the form of a grand dinner and ball, which were reminiscent of the glory of Victorian days (see over the page for photographs of this affair).

It was this final function which made a deep impression on our mind and led us to contrast the ways of England with those of France under comparable circumstances. Our thoughts harked back to the Chemical Dinner and Dance—to single out one example among many annual functions of learned bodies. Now it became clear why it is that these have always proved to be one of the most

depressing ordeals that it is possible for human ingenuity to devise. The mass segregates itself into little refractory groups, all negatively charged. Not much fun for anyone who happens to be a group unto himself!

The French counter this tendency by long tables, mixing up the guests (even husbands and wives, as shown in photograph), and establishing a custom whereby one introduces oneself to one's neighbours right at the beginning of things.

Certainly the most vivid and lasting of the impressions carried away by those who were privileged to attend the Congress will undoubtedly be those of the various receptions and other functions held in the late afternoons. There were, for instance, the receptions of the Paris Chamber of Commerce, the Ministry of Agriculture, and above all the grand dinner and ball which formed the climax to the whole proceedings. We must surely take off our hats to the French for the magnificent way in which they stage-managed these affairs. They were organised to impress, and impress they did. At the same time, there was no trace of vulgar ostentation. They were vivid and somewhat emotional, but equally dignified and formal. It is only the French who can do these things really well!

We had almost forgotten to mention the generous offerings of food and drink which followed the bowings and speech-makings of glorious officials. Champagne was poured out in the "grand manner" by dignified butler-like gentlemen in white gloves, and then there was an intermingling of visitors which became more and more friendly and intimate as corks popped and the amazing creations of confectionery art circulated. As a means for "making contacts" nothing could be better. Not even British reserve could stand up to this sort of treatment.

As regards the real business part of the Congress, when papers were read and discussed, a few impressions may not be out of place. In our opinion, and we were not alone in this, the mistake was made (and it is a mistake all too commonly made at similar affairs in this country) of not providing members with copies of the papers at least a couple of weeks before they are actually presented. True, a report containing the complete papers in some instances and in others summaries, was distributed on the day following the opening ceremony, but that did not prevent people occupying valuable time by reading through them at the meetings or giving the full text of the summaries. It is our firm conviction that contributors should on these occasions not be permitted to read papers, but merely to give a summary bringing out the main points which they wish to make. Ten minutes in each case is ample time for this, and contributors should be rigidly confined to say all that they want to say within this time. This would then give a fair opportunity for people to ask questions and to take part in discussions, which is really the reason why they take the trouble to travel by land and sea to gather together at any chosen point. Another matter which is worth attention in the interests of those who are indifferent

A Group of Members of the Congress on the steps of the Conservatoire National des Arts et Métiers. The British delegates, Mr. Leonard Hill and Dr. H. B. Cronshaw, are marked with a cross.

Dinner at nine. The Closing Ceremony of the Congress.

linguists (and scientific workers as a rule belong to this class) is that an interpreter should be stationed on the platform to render English, Chinese, or any other language into French or *vice versa*. It is only by making that provision that a Congress can be truly labelled "International."

We need say little at this point about the papers themselves. It is only to be expected that they proved to be in quality a little mixed. Some, particularly those relating to sugar and fermentation, were excellent.

The proceedings of the sections dealing with cider, wines, spirits, and other fruit products were almost entirely confined to consideration of papers by French workers. Many of the reports, unfortunately, did not add considerably to the facts which were already common knowledge, and at times one had perforce to place one's trust in R. L. S.'s dictum that "It is better to travel hopefully than to arrive."

There was, however, a series of papers of a practical nature which contained several new ideas, and a very brief résumé of these will be given here.

Apple Juice and Cider

The filtration of freshly pressed apple juice was stated to be a commercial proposition by Maurice Hanslin, but his contention was vigorously denied by Professor Dauthy of Rennes. There was a long discussion between the two protagonists, and it appeared that the latter was chiefly concerned with the economic aspect of the problem, while the former stressed the fact that filters were procurable which would give an economical yield. (It is interesting to note that a continuous filter fitted with special grids, on which the filtering medium was laid, was on view at the Exhibition.)

The clarification of apple juice by a product, "Gelzam," an aluminium paste, was described by Zamaron, who had obtained some suggestive data as a result of applying to fruit juice methods used in the sugar refinery. The product, which is a proprietary one, would appear to be similar to the alumina cream used in the clarification of sugar extracts for quantitative polarimetric analysis.

Professor Dauthy and Mdlle. Abadie discussed the control of fermentation by removal of nitrogen from the juice. A definite correlation between rate of fermentation and nitrogen content of the juice was discovered, and complete cessation of fermentation was observed in cases where the nitrogen was present in quantities as low as, or lower than, 0·0015 per cent. This low percentage of nitrogen could be obtained by filtration of the juice, with consequent removal of nitrogenous material. (These data had been previously ascertained and published by Grove at Long Ashton in 1920.)

The vexed question of metallic contamination of cider received but scant attention, but a paper by Warcollier and Tavernier described a series of tests which had shown conclusively that chromium-nickel steels were of great importance for use with cider. Their resistance to a variety of fruit products when tested for about three months was very considerable.

Vernon L. S. Charley (University of Bristol Agricultural Research Station) read a paper on the control of fermentation by the centrifuge. Large scale tests were

described, which showed that fermentation could be completely stopped by centrifugation of the fermenting juice at gravities below 1·030. An interesting feature of these tests was the presence in the centrifuged ciders of a considerable number of yeasts, and the absence of any subsequent fermentation could only be explained by assuming that these yeasts were in some way inactivated. The advantages of speed, cleanliness, and ease of manipulation possessed by the centrifuge when compared with the filter were emphasised, and the greatly enhanced qualities of flavour, aroma, bouquet, and mellowness of the centrifuged ciders were described.

The author pointed out that passage of a fresh juice through the centrifuge did not result in any retardation of subsequent fermentation, although an almost complete removal of yeasts had been effected; as a result of this observation the author put forward the theory that the rate of fermentation was dependent not on the numerical strength of the yeast cells present, but on the richness of the medium in assimilable nitrogenous compounds. It was further shown how, to obtain maximum control, a heavy crop of yeasts should be allowed to form, and these removed (together with a large amount of nitrogen) by the centrifuge. Such a crop of yeast is usually formed after the original gravity of the juice has fallen about 8-12 points. The author concluded by remarking that several factories in England now used the centrifuge exclusively as a means of retaining the natural sweetness in the early season's juices, which are naturally predisposed to ferment at a much faster rate than those in mid and late season.

Pectin. Qu'est que c'est le procés?

The following is a translation of a short note contained in the Volume of Proceedings issued during the Congress:

"*On a New Method of Extraction of a 'Dried Pectin' from Apple Pomace.* The different processes employed to obtain a pure dried pectin have only afforded imperfect results. By a new method the authors have succeeded in extracting from pressed apple pomace a dried pectin of 98 per cent. purity, which offers considerable interest for all those who utilise pectin compounds, and particularly for confectioners who employ for certain confections pectin preparations which contain only 5 to 6 per cent. pectin and as much as 9 to 10 per cent. impurities. The pure 'dried pectin' has a 'setting' power thirty times greater than that of pectin syrups."

After mental digestion of this précis the stage seemed set for the *pièce de résistance* of the day. Unfortunately, the précis represented the sum total of information which the author, Adrien Macé, Vice-President of the Chamber of Commerce of Cherbourg, saw fit to divulge. The question above was flung by member after member of the Congress to the President, who could only reply that M. Macé had merely treated the question in its broadest aspect and that there was nothing further to add.

It was disappointing, for no one who is acquainted with pectin manufacture could fail to be moved by the prospect of obtaining such a pure dried pectin from apples. From information gleaned at a later session it seems probable that the process is being patented, and the unfinished nature of this proceeding was such that premature exposure of the facts would have proved fatal.

But it does seem farcical to include such a paper in a series of scientific discussions, where absolute frankness is the rule and not the exception.

Œnology

This section was largely concerned with the industries centred round the grape, and it is significant to note that little actual wine-making information was presented. The conservation of grape juice in bulk proved one important topic for discussion.

Monti's freezing process appeared to be still largely a national process, very few factories outside Italy having used this method. Cheap electrical power, for refrigeration and to supply the power for the centrifugation of the

Congressmen—
and Ladies — meet
for the Grand Ball.

frozen "must," is a necessity, and this, probably more than any other factor, has militated against the more widespread use of the method. The necessary temperature is about −3° C., and a basket type of centrifuge, similar to that used in this country for the separation of sugar crystals from syrup, is satisfactory. By a single treatment a concentrate of 25° Baumé is obtainable, but it is essential to raise this figure to 35° Baumé to ensure good sound keeping quality in the concentrate. This may be effected by means of evaporation *in vacuo* at low temperatures. Large quantities of grape juice are concentrated by vacuum evaporation alone in Algeria (contribution of M. J.-Henri Fabre), where the maximum temperature allowed throughout the process is 40° C. Even slightly higher temperatures caused a darkening of the concentrate and the production of a bitter flavour, which is a disadvantage to the final product.

The clarification of the fresh juice previous to concentration is carried out in Algeria by sedimentation, while the juice is kept sweet by a single cooling of the juice to −2° C. or the addition of 10 oz. SO_2 per 100 gall. Such a quantity of SO_2 is liable to have a corrosive action on most types of metallic surfaces, and in practice juices treated in this way can be stored only in wooden or glass-lined vats.

The concentrated grape juice was being used for cooking syrups, for confectionery and pastry, to sweeten white wines, and to add to fresh juices to raise the gravity and increase the alcoholic strength. In countries—such as England—where the concentrate can legally be broken down with water and fermented, very good wines can be, and indeed are, produced.

Semichon described in detail the Seitz-Bohi process for the clarification of fruit juices, which consists in mixing the fresh juice, immediately after its expression from the pulp, with a quantity of CO_2 sufficient to prevent any fermentation. This quantity is 15 grams per litre (equivalent to a pressure of 8 kg. at 75° C.). The usual procedure is to employ a gentle flocculation with gelatin and tannin, which is usually complete after a fortnight, during the storage under CO_2.

Henri Astruc (Director of the French Œnological Station du Gard) emphasised the importance of employing macerations in all extractions of juice from fruits. He adduced data to show that the vitamins were present in the pulp of grapes and not so much in the juice, and hence, to procure as high a vitamin content as possible in the expressed juice, the pulp should always be allowed to macerate in order that some solution of desirable elements from the *marc* may occur.

Thermophilic Bacteria

Mr. H. H. Cheftel read a paper on Thermophilic Bacteria and their importance in the canning industry.

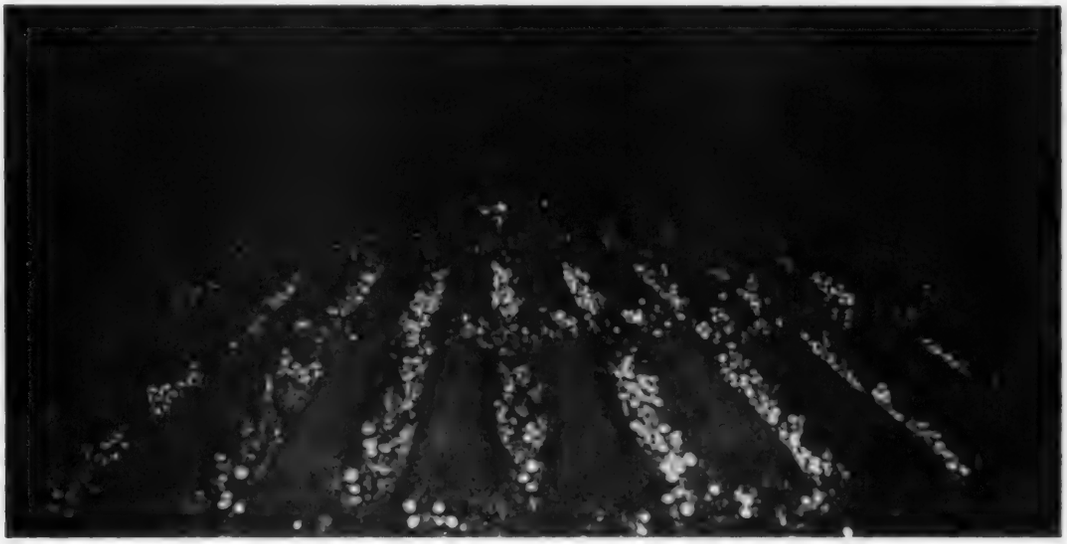
After dealing with the work of American authors and reviewing their highly important industrial studies on the subject of thermophilic bacteria in preserved foods, as well as the practical and theoretical data derived therefrom, the author gave an account of his experiments in various French factories.

He described methods for identifying these bacteria and for the preparation of cultures, and also the precautions to be taken so as to avoid those manufacturing faults which may be occasioned by their presence. Attention was drawn in particular to the class of thermophilic bacteria typified by *B. stearothermophilus*, responsible for the bulging of canned legumes.

Sugar, it was stated, is very often the main source of contamination and calls for tests of its purity before use.

Cellulose Fermentation

The Soc. de Distillerie des Deux-Sèvres and M. H. Langwell read a paper on the direct fermentation of cellulose by thermophiles.



View of Mushrooms under cultivation in the Moulineaux Galleries hewn out of the solid chalk at Issy-les-Moulineaux, a suburb of Paris.

(Courtesy of Chalbot and Cie.)

Closing and Retorting Cans in the Paris factory of the Conserveries Petitjean.

Large-scale fermentation of cellulose material to acetic acid calls for rapid output as well as, in particular, regular operation.

Two conditions must be observed to achieve these objects; employment of a suitable alkali to maintain required acidity, and avoidance of contact of the fermenting mass (*mout*) with metals exerting oligodynamic action.

Alkaline substances giving the greatest satisfaction are those forming soluble phosphates, such as carbonates and hydroxides of sodium, potassium, and ammonium. Carbonates and hydrates of calcium, barium, and magnesium are less suitable.

The authors have shown that iron exercises an undesirable oligodynamic action under the conditions of fermentation and should be ruled out.

Bread Making

Dr. Kent-Jones presented a paper on the types of wheat used in Great Britain and Ireland and the characteristics of the flours produced therefrom. He explained that in the United Kingdom practically every wheat is used at some period or other by the millers, although generally Manitoba wheat is the basis of the mixture, and a wide range of baking processes employed. The majority of bread is made with compressed distillers' yeast. The use of leaven instead of yeast is practically extinct, although much of the long system Scotch bread is still made by setting barms—that is, with the use of what might be called "spontaneous yeast."

Bleaching and improving processes are permitted and are generally practised.

A very large proportion of the English wheat crop is used for biscuits, as biscuit makers desire a weak flour, and English wheat appears to be specially useful for them.

The vast majority of bread in the United Kingdom is baked in tins and is, therefore, definitely of the non-crusty type. The trend seems to be more and more for tin loaves and to make less of the crusty loaves of the cottage and Coburg type. It is possible that this is partly responsible for the belief that there is less flavour in modern bread than there used to be. Regular flour of medium to good strength is wanted which works easily and has a reasonably good water absorption. There is also a big increase in the demand for sandwich loaves—*i.e.*, loaves baked in closed square tins. These loaves can be very easily cut into sandwiches, and the crumb is of a close type. There is less chance of holes, which are always undesirable in English bread. The majority of bread is made very simply from flour, water, salt, and yeast. It is much plainer than American bread. Although yeast foods, such as malt, are often employed and many bakers use 1 to 2 lb. per sack of lard or oil, which gives a certain "shortness" and pleasant flavour to the crumb, yet milk powders and enriching ingredients of this sort are but rarely employed.

Milk Factory Effluents

In a paper on the treatment and disposal of waste waters in Great Britain, presented by the Economic Advisory Council of the Department of Scientific and Industrial Research, some observations were made on milk factory effluents.

Another View
in the
Conserveries Petitjean.

In recent years there have been many instances of serious pollution by effluents from dairies and milk products factories. Pollution of this kind is likely to become even more serious with further development towards centralisation in the industry unless satisfactory means can be adopted for treatment and the disposal of the effluents. Laboratory experiments have indicated that effluents of the type produced at milk collecting and distributing depôts can be satisfactorily purified by treatment in two stages. In the first stage the effluent is allowed to ferment to separate fats and protein. The liquid from the fermentation stage is then biologically oxidised in percolating filters. Extension of this investigation to include experiments on a large scale is under consideration.

The treatment of beet sugar factory effluents was also discussed. The problem has been carefully investigated, and it has been proved that under certain conditions beet sugar factory effluents can be sufficiently purified by biological oxidation on percolating filters to allow of their discharge, except into the smaller streams, without causing serious pollution. It has been demonstrated, therefore, that gross contamination of rivers by effluents from beet sugar factories can be avoided.

We take this opportunity of informing readers that Dr. Norman, of the Rothamsted Experimental Station, will deal with the subject of beet sugar effluents in the next issue of FOOD MANUFACTURE. He has already contributed an article in a recent issue on milk waste.

Visits

Mainly through the courtesy of Mr. H. Cheftel, who controls the biological and chemical research laboratories of J. J. Carnaud and Forges de Basse-Indre, manufacturers of tinplate and can-making machinery, we were enabled to visit several factories, laboratories, and educational institutes in and about Paris.

One of the most interesting was the up-to-date canning factory of Petitjean, Gay and Cie, established in 1863. It was such a factory as only exists in France. Here an amazing variety of products are canned and bottled, such as snails, cock's-combs, pork and beans, mushrooms, truffles, salmon, game, soups, vegetables and fruits, pâté de foie gras, salmon, herring and mackerel in white wine, sardines, and others, many of which are unfamiliar to the English visitor.

Another place of great interest which we were privileged to see was the Champignonnières des Moulineaux, operated by Chalbot and Cie, where mushrooms are grown on a vast scale in a network of galleries hewn out of the chalk. It was surprising to see the skill and care with which this cultivation was carried out. The system of ventilation and provision of water was well planned, and the methods of cultivation and collection were admirably performed.

We spent several profitable hours under the guidance of Mr. Cheftel and Mr. Claude Barbizet inspecting the new slaughter-house of La Nationale, Société Industrielle d'Alimentation, of which the latter is a director and largely responsible for its layout, which rivals the best that Chicago can show. The pig-killing, de-hairing, and dressing equipment is completely in accordance with modern ideas.

Unfortunately, we have no space in which to dilate on the interesting things seen on the occasion of visits to Mr. Cheftel's laboratories and the works which they so admirably serve, nor have we here the opportunity to write about our visits to the Milling and Baking School under the direction of Mr. Pisani-Borg, the new laboratories at the College de France, and the laboratories at the University and at the Pasteur Institute, where we met Professor Fernbach, who was once an assistant of the great Pasteur himself. But one thing we must mention before closing, and that is that mainly through the efforts of Dr. Macheboeuf, of the Pasteur Institute, and Mr. Cheftel, an Institute—the École Technique de la Conserve—has been established in Paris for the instruction of those who are engaged upon or are about to enter into the food preserving industry.

HONEY SPOILAGE

What are the factors responsible for the spoilage of honey, and how may spoilage be prevented? These questions are discussed in the light of recent researches by Professor H. F. Wilson, Director of Agriculture at the Wisconsin Agricultural Experimental Station.

HONEY is the oldest natural sweet of which we have any record, but not until recent years has it been given much attention by the chemist except to secure general analyses for the determination of its chemical composition.

For the most part these analyses have been made for the purpose of purity determinations in order to set standards by which adulteration of honey could be readily detected.

A limited amount of research has been done in analysing honey from different floral sources, which shows distinct differences in the amount of ash, dextrin, and sugars present. The conclusions to be drawn from these investigations simply show that honey is primarily a carbohydrate substance containing a mixture of invert sugars averaging approximately 38 to 40 per cent. levulose, 34 to 35 per cent. dextrose, and from 1 to 10 per cent. sucrose. The moisture content varies from 14 to 20 per cent., and the dextrin less than 1 per cent., unless mixed with honeydew. Small amounts of all the minerals found in milk have been reported from the ash.

From the viewpoint of the analytical chemist this information is perhaps sufficient, but to those who are engaged in the beekeeping industry it seems quite necessary that a more accurate knowledge be gained concerning the microbiology of honey and particularly any biological factors which may prove to be valuable in honey when used as food.

In these phases our knowledge is quite incomplete, and an exhaustive study will be necessary to provide accurate information on the food value of honey.

Source and Nature of Honey

Honey is a sweet viscid substance produced by honey bees from the nectar of flowers. Its flavour and colour are derived from the nectar, and vary with the floral source from which the nectar is taken. So-called "impure" honey may be produced from sugar syrup, fruit juices, and from honeydew of both plant and insect origin.

The process of collecting the nectar from the flowers by the bee is reasonably well understood, and the chemical changes which occur in the progress from nectar to honey have been presumably well demonstrated by chemical research.

Nectar-producing plants of many species are widely

Bee Farming at Welwyn, Herts.
A consumer wearing a veil when buying a consignment of bees.

distributed throughout the United States, so that commercial crops of honey are easy to secure. In many areas of the north clover and alfalfa are grown extensively for hay crops and pasture. The honey from these plants is agreeable to the taste and, because of abundant nectar secretion, offers unusual opportunities for commercial beekeeping.

Any statements made concerning the chemical composition of honey and the danger of deterioration must be relative. For honey from the same source varies from year to year in the same locality, and may vary to a greater extent in more distant localities. These differences are due, of course, to variations in climatic and soil conditions.

It can also be shown that there is considerable variation in so-called " ripe " and " unripe " honeys. It is generally considered that all honey is ripe when it has been sealed in the comb by the bees. If this were true, all sealed honey of the same source should contain about the same amount of moisture. However, our observations show that sealed honey of the same season may vary from 1 to 2 per cent. in moisture content, and that unsealed honey may contain less moisture than sealed honey taken earlier or later in the season from the same apiary.

These varying conditions make it quite difficult to establish a standard for ripe honey and an established standard weight of 12 lb. to the gallon. Two distinct operations occur in the production of honey by the bee:

1. The nectar is collected by the bee and carried to the hive, where it is worked upon mechanically by the bee to evaporate the excess moisture.

2. During the mechanical operations of the bee in carrying the nectar to the hive and manipulating it to evaporate the excess moisture, inversion, perhaps already started in the flower, is completed by enzymes and chemicals from the body of the bee.

The Honey Spoilage Problem

The honey industry in the United States is of much greater importance than the layman might believe. For it is estimated that 800,000 persons are keeping bees. The average production cannot be accurately estimated, for a considerable portion of the crop never passes through trade channels. In the State of Wisconsin a normal crop will approximate 10,000,000 lb., and estimated crops of 18,000,000 lb. have been produced in more favourable years. This is not a large amount as compared with other crops, but it affords a source of revenue to many farm beekeepers that is of extreme importance in certain years.

In the process of carrying this honey from the producer to the consumer it is often necessary to hold shipments in storage for many months. Frequently shipments of honey undergo fermentation during these periods of storage, and a serious monetary loss follows.

There is a general opinion in the minds of many beekeepers, and others as well, that honey will keep indefi-

Removing One-pound Combs of Honey at Welwyn.

nitely, and it is actually possible to keep honey in its natural condition over a very long period of time if properly stored. However, because of the ease with which honey is broken down, it may be considered as a readily perishable product under average conditions, and those who have had an opportunity to observe many samples of honey recognise the fact that honey deteriorates in colour and flavour very rapidly at relatively high temperatures and spoils from fermentation at relatively low temperatures when contaminated with yeasts.

Among the bottlers and brokers, honey that is one year old is generally considered inferior to freshly extracted honey. Also the bottlers are suspicious of any honey that they buy after the first of January because of the possible danger of fermentation. This fear on the part of the bottlers or dealers is well founded, but the exact cause has not been demonstrated until in recent years.

"Beekeepers are unaware that there are good and bad methods of storing honey after it has been extracted. However, we know from our own observations and experiments that temperature is of the utmost importance when honey is held in storage over long periods of time. We have samples that have now been in storage for more than three years and, up to the present time, show no signs of deterioration, either from fermentation, loss in flavour, or change in colour" (Wilson and Marvin[19, 20]).

There are three general conditions to be found in the deterioration of honey, any one of which is sufficient to lower the market grade of the product. These are, in order of importance: first, spoilage by fermentation; second, loss of flavour; and, third, colour changes in which the colour passes from a lighter to a darker grade. The proper handling of honey after it has been removed from the beehive and during its progress to the consumer is therefore a very important problem which has received very little study.

If honey is not well ripened or is allowed to absorb moisture while stored in open tanks, fermentation is sure to occur when the temperature conditions are satisfactory. And even supposedly well-ripened honey is subject to fermentation as a result of the physical changes which occur during granulation after the honey is extracted and put in cans or jars.

All honeys which contain a high content of dextrose sugar, soon after being extracted, take on a crystalline form, and a superficial examination would lead one to believe that all of the honey had changed to crystals. But a more detailed examination would show that only the dextrose had become crystallised and that it is dispersed in a levulose phase.

When honey is first extracted, the moisture which it contains is evenly distributed, but during the process of crystallisation dextrose hydrate crystals are formed and the free water is diluted in the levulose liquid phase. If the total moisture content is low, the crystals are small and form rapidly throughout the liquid phase. If the moisture content is high, the crystals are apt to be larger and form more quickly in the lower area.

Fermentation begins at the top and slowly spreads down through the mass of honey, so it has been believed that the top area of crystallised honey contained more moisture than the bottom area. That this is true has been shown by Marvin and Wilson.[10]

To demonstrate the relation of temperature to honey spoilage, Mr. Marvin and the writer constructed four thermostatically controlled temperature chambers in the bee culture laboratory of the Wisconsin Agricultural Experiment Station in 1929. The temperatures were set at 40°, 60°, 80°, and 100° F. respectively.

A series of sixteen samples[1] extracted at weekly intervals from the beginning of the honey flow, June 26 to October 17, were placed in each chamber. A chemical analysis, including moisture determinations and colour grades, was made for each sample. After storage in the temperature chambers for one year, one of each series of sample was removed, colour tests were made, and the moisture content determined. Observations were also made for fermentation.*

Yeasts in Honey

Specific determinations of the yeasts causing fermentation in honey have come mostly in recent years. Richter[11a] in 1912 described and named one species

* A complete description of these samples is given in the *Journ. Econ. Ent.*, **24**, 589-597 (1931).

Interior View of one of the Constant Temperature Chambers used by Professor Wilson in his Honey Storage Studies.

Zygosaccharomyces mellis acidi in fermenting honey from Russia. No later determinations were made until Fabian and Quinet,[4] in 1928, isolated five distinct groups of yeasts which they considered as belonging to five species, of which two were new.

The three yeasts which they concluded had been previously described were *Zygosaccharomyces japonicus, Z. barkeri,* and *Z. priorianus.* The two new yeasts were described as *Z. mellis* and *Torula mellis.* In 1929, Lochhead and Heron[6] described two new species of yeasts, *Zygosaccharomyces nussbaumeri* and *Z. richteri.* Marvin, while at the Wisconsin Agricultural Experiment Station, came to the conclusion that the species considered by Fabian and Quinet as *Z. barkeri* was not the same as cultures of that species secured from several type cultures.[11] Cultures of *Z. priorianus* secured by the writer from the same type collections are distinctly different from the species described under that name by Fabian and Quinet. Marvin[11] has also found two new species of *Zygosaccharomyces,* which are as yet unnamed.

In our investigations of the yeasts occurring in and around the apiary we have found many different strains, but only a few of these are capable of fermenting honey, and they are all more or less alike in appearance except that certain morphological differences appear that are noticeable under the microscope. All of the strains so far found in honey belong in the *Zygosaccharomyces,* and in no case have we found any strains of *Torula* in fermenting honey, as reported by Fabian and Quinet.

Honey Storage Experiments showing how jars were prepared for testing amount of moisture present in measured sections of a column sample of honey. 1, Front View. 2, Side View.

Sources of Infection

Sugar-tolerant yeasts capable of fermenting honey occur more or less abundantly in and about all bee yards, as shown by the investigations of Lochhead and Heron[1] and Lochhead and Farrell[2] in Canada and Wilson and Marvin[14] in the United States. Lochhead and Heron found that yeasts capable of fermenting an 80 per cent. solution of honey occurred on almost all flowers visited by bees. Of the eleven types of yeast secured from flowers, two were found to be identical with two types isolated from honey.

They also made a study of the nectar from the hive and found an early and constant infection from four yeast types. Two of these were identical with yeasts found in fermented honey.

Five sugar-tolerant yeasts were isolated from the air and honey tanks in the extracting house, and three of these were found to be identical with yeasts isolated from fermented honey.

From May, 1929, to April 17, 1930, Lochhead and Farrell made an investigation of the soil as a source of infection of honey by sugar-tolerant yeasts, using six different locations for taking soil samples. Samples of soil were taken during all of these months from a flower garden, apiary (new ground), apiary (old ground), an orchard, clover field, and cereal field. Yeasts were found in the clover field during June only; at no time were they found in the flower garden, orchard, or cereal field.

In the apiary (new ground) sugar-tolerant yeasts were found during each month except September. In the apiary (old ground) sugar-tolerant yeasts were found to be abundant during every month in the year.

These observations show that honey-fermenting yeasts are present in the environment of the bee yard at all times, and it is reasonable to suppose that they may be easily carried to the beehive by wind or by the bees themselves.

The contamination of the soil of the bee yard is readily brought about by dying bees and drops of honey scattered about by the beekeeper in removing the honey from the hive.

In our investigations we have found that numerous sugar-tolerant yeasts may be isolated from the tongue, legs, honey sac of the bee and pollen stored within the hive.

We have also found that samples of a 50 per cent. honey solution covered with wire screen to keep out bees and other insects were readily contaminated with sugar-tolerant yeasts when allowed to stand on hives in the bee yard.

Only a few of these types have so far been found to be identical with yeasts secured from fermented honey, but it is quite evident from the various observations reported that nearly all honey is likely to be contaminated with yeasts during the process of changing it from nectar to honey by the bees.

Relation of Moisture to Fermentation

Beekeepers have for a long time known that excess moisture has some relation to the spoilage of honey by fermentation, but without any very clear idea of how the process of fermentation was brought about.

It is well known that honey extracted early in the season from unsealed combs is more likely to ferment than honey from fully sealed combs or from even partially sealed combs extracted later in the season. Honey that is high in moisture content and taken from partially sealed combs early in the season is generally considered unripe because of the ease with which it ferments. Honey from fully sealed combs is generally considered as ripe honey, but many beekeepers believe that the maturing process, and a consequent reduction in moisture content, continue after the honey has been sealed by the bees, and do not remove the honey from the hive until a month or more after it is fully sealed.

In 1901, at the request of Canadian beekeepers, Shutt[12] made a study of the moisture content of ripe and unripe honeys to see what relation the differences might have to fermentation. He found, in 1901, that honey from completely sealed combs varied in moisture content from 15·46 to 16·95 per cent. Partially sealed combs varied from 19·12 to 21·03 per cent. moisture, and honey from totally unsealed combs varied from 18·25 to 22·09 per cent. This difference of 4 to 5 per cent. moisture content between the sealed and partially or wholly unsealed combs was sufficient to cause fermentation in both the partially sealed and wholly unsealed cells.

The results for 1902 showed quite different results that are easily explained by possible climatic differences and rapidity of honey flow.

Honey from wholly sealed cells contained from 15·78 to 17·35 per cent. moisture. Honey from partially sealed cells contained from 15·31 to 15·90 per cent. moisture, and honey from wholly unsealed combs contained from 16·18 to 17·13 per cent. moisture.

No further effort was made to secure data on the fermentation of honey until 1923, when we began our studies at the Wisconsin Agricultural Experiment Station. About the same time Fabian and Quinet[4] began similar studies at the Michigan Agricultural Experiment Station, and a little later Lochhead and Heron[6] began a comprehensive study of the subject in Canada. The writers considered moisture as the more important factor in fermentation. Space does not permit of a detailed review of their work, and a brief summary should suffice.

Fabian and Quinet, in summing the results of their investigations, gave eight conclusions regarding fermentation in comb and extracted honey. Three of these are important in the present discussion and are quoted verbatim:

> "Honey is hygroscopic and under favourable conditions may readily absorb sufficient moisture to be fermented. Under the conditions of the experiment eight samples of extracted honey of approximately 100 gm. each absorbed a minimum of 25·90 and a maximum of 32·99 per cent. of moisture at 20° C.
>
> "The critical moisture point at which fermentation took place seemed to be in most cases approximately 21 per cent. Twenty-one samples of honey were analysed for moisture content, seventeen of which were classified as abnormal and four as normal. The moisture content of the normal honeys ranged from 20·10 to 21·13 per cent., with an average of 20·72 per cent., while the moisture content of the abnormal honeys ranged from 17·30 to 28·39 per cent., with an average of 23·02 per cent.
>
> "A theory is advanced to explain why such a concentrated mixture as honey ferments. Briefly stated, the theory is that honey, being hygroscopic, absorbs sufficient water at the surface to lower the concentration of sugars there to a degree compatible with the life of certain yeasts. The yeasts present gradually become accustomed to the higher sugar concentration and eventually grow throughout the honey. It is also a well-known fact that in unripe honey, where the bees have been unable to evaporate the water sufficiently, fermentation is most likely to occur."

Lochhead and Heron[6] named five important factors which they believed were concerned with the spoilage of honey by fermentation. These are in the order given: Temperature, moisture, crystallisation, "degree of inversion of sugars," and the "content of soluble nitrogen." They stated that "little or no growth occurred about 40° C., and confirmed Marvin's findings in that no yeast growth was obtained below 50° F. They were of the opinion that "moisture" is the chief factor, and that when other things are equal a honey of high moisture content will ferment more quickly than one of low moisture content.

(To be continued.)

Honey Storage Experiments. Jars 1 to 4 were all taken from the same original sample. After a few months in storage, jars 1 to 3, stored at 60° F., were fermented throughout, and the granulated phase of 1 and 2 was beginning to settle to the bottom. Jar 4 was stored at 40° F., and similar samples stored at that temperature had not fermented at the end of 4 years.

BEVERAGE FLAVOURS

Carelessness in flavouring can make or mar an otherwise perfect beverage. Harold Morgan, M.Sc., discusses the main points to be considered in the choice and use of flavours.

A LARGE variety of drinks come under the heading of beverages, but as so many of these owe their distinctive taste and qualities to properties inherent in the originating materials—*e.g.*, tea, coffee, cocoa, wines, spirits, beers, etc.—the addition of flavours is restricted more or less to beverages which are commonly grouped together under the heading of "mineral waters, etc."

It must be admitted that some of the beverages mentioned above are themselves incorporated in certain preparations as flavours. Cocoa, for instance, is a common ingredient of various health foods, giving a flavour and taste which masks what might be an unpleasant or flat taste. Malt extract is used both for its flavour and its food value. Up to the present coffee has not played a large part in this connection, but the introduction of concentrated and vacuum dried extracts opens up possibilities.

The heading "mineral waters, etc.," covers beverages such as those which are aerated, artificial mineral waters, syrups, non-alcoholic cordials, squashes, non-alcoholic fruit wines, non-alcoholic brewed beers, etc.

When considering drinks of this nature, suitable flavours have to satisfy various requirements depending on the type of drink in question. They must be soluble, or, if not, must suspend throughout the liquid in equal concentration. In many cases the finished product is required perfectly clear. The degree of sweetness varies according to the drink manufactured, and this has to be taken into account when blending up suitable flavours. Syrups for aerated waters are usually 45° Tw. and contain 6 lb. sugar per gallon, while cordial and fruit syrups at 30° Tw. contain 4 lb. sugar per gallon. Each is diluted, and the effect of this addition of water must be borne in mind.

Local conditions, likes and dislikes, play an important part in determining the exact blend of flavours. The same flavour is rarely acceptable in all parts of the country. Tastes differ so much that, even in different parts of the same county, flavours have to be modified to suit local preferences.

But, above all, a flavour must be true to type. This is where many manufacturers show a decided weakness—both manufacturers of the flavour and the users manufacturing the beverage. Admittedly the question of cost is important, but surely the quality of the flavour is still more important, as this is the determining factor controlling consumption—or lack of it. Furthermore, the actual amount of flavour used is only a small proportion of the total cost.

An essence maker's list includes an enormous number of flavours under headings such as "soluble essences," "concentrated essences for liqueurs and syrups," "highly concentrated essences for non-alcoholic wines," "concentrated syrups," etc. They are further classified under three descriptions—"natural," "compound," and "synthetic." Natural essences are made from fruit and natural products only. Compound essences are blends of fruits and other natural products with various additions. Usually a fruit or natural product forms the base and the flavour is strengthened by the addition of suitable chemicals. Synthetic essences, as the name implies, are composed entirely of various chemicals blended to resemble the flavour of a natural product or to produce a fancy flavour.

The natural essences are solutions or extractions of natural products with suitable solvents, distillation being necessary in some cases to give the best quality. The best solvent undoubtedly is alcohol (ethyl alcohol). It is expensive, as the heavy duty imposes a surcharge of 7s. per lb. of essence on all essences containing the spirit (this figure is based on the proportion of alcohol present in essences which is a quantity standardised by the various essence makers). Other solvents have been tried out, but in many cases they are not suitable for quality flavours on account of solvent taste or possibility of toxic properties. Isopropyl alcohol seems to be the best of the substitutes, though it has a certain taste of its own. Its toxicity does not appear to be detrimental when the small amount of flavour present in beverages is taken into consideration. Certain other solvents can be used, but they are of more value for confectionery flavours.

The necessary conditions of soluble essences are fine flavour, high concentration, and perfect solubility. Most aerated waters, cordials, and wines are perfectly clear, but a few beverages—*e.g.*, squashes—have a cloudy

appearance. Ginger beer, for instance, can be obtained in "glass" form as well as in the cloudy state. The maintenance of cloudiness in this case depends upon a suspension of certain principles extracted from ginger roots. A flavour recently brought to notice guarantees cloudiness for a reasonable period of time, and will be advantageous in such cases where this effect is required. It opens up also the possibility of introducing cloudy aerated waters giving the appearance of more body.

Fruit juices, particularly of the citrus variety, have come to the fore in recent years and are very popular at present in the form of squashes. These juices contain the cells of the fruit, which are more or less suspended in the syrup. Filtered juices can be used in cordials.

The manner of storage of these juices is important, as they are so liable to fermentation. The Preservative Regulations allow of the presence of sulphur dioxide to the extent of 350 parts per million, but even this will not prevent deterioration, particularly during the warm weather, unless the juices are kept in cool stores.

We have seen that an essence is the soluble form of a flavour suitable for adding to various syrups used in the manufacture of beverages. The materials from which these essences are derived cover a wide range of substances, some of which cannot be grouped together under a single classification.

One of the chief classes of the natural flavours is that of the essential oils, sometimes referred to as volatile oils because they can be volatilised by steam distillation. In fact, the majority are recovered from the raw material by distillation processes. The principle applied is to pass steam through the heated material and the oil can be collected from the surface of the condensed distillate. Peppermint and almond are well-known examples of distilled oils.

Some oils, particularly of the citrus type, are expressed. The oil is contained in the rind cells, which are broken by friction and then pressed out. Lemon is an excellent example of this class, and the hand-pressed variety undoubtedly gives a most excellent taste and aroma. With the introduction of machinery for pressing it is doubtful whether any really genuine 100 per cent. hand-pressed oil ever reaches the market nowadays. Oil of limes is interesting in that two kinds can be obtained—a hand-pressed and a distilled, the latter being much the cheaper.

A considerable proportion of an essential oil consists of hydrocarbons known as terpenes, which are valueless from a flavouring point of view as well as being definitely insoluble. Other hydrocarbons (known as sesquiterpenes) with similar characteristics are also present in lesser amounts.

By a process of distillation *in vacuo* or distillation with alcohol, the terpenes and sesquiterpenes can be removed and the vital flavouring principles obtained free. These concentrated oils are of great value in the beverage industry, as they are more soluble and, with spirit, give clearer solutions in the absence of the terpenes. Incidentally, from the point of view of the buyer, it is worth noting that all oils sold as "concentrated" are not necessarily terpeneless.

A number of raw materials contain certain flavouring principles of value in beverage making which have to be extracted by spirit—*e.g.*, ginger, vanilla, etc.

Pure chemicals with flavouring properties are numerous and are used extensively in the cheaper essences. Some of these have flavours almost similar to those of natural products, such as vanillin, which is a universally recognised susbtitute for vanilla beans.

Fruit juices pressed from the natural fruit usually are concentrated under vacuum to get rid of most of the water. They are preserved by sterilisation or, with sugar, in the form of syrup.

Flavour making and the blending of materials to make new flavours open up considerable possibilities for the manufacturer who wishes to introduce distinctiveness into his beverages. Successful results in this direction require a thorough knowledge of the materials handled, of the uses to which the flavour is to be put, and careful and patient experimentation. It must be emphasised again that the flavouring of beverages—indeed, of all foodstuffs—is vitally important. These insignificant amounts of such ingredients can make or mar the turnover.

PROBLEMS OF POTATO GROWING

DURING the last few years the potato crop has played an important part in helping intensive farmers to stand the strain that has been placed upon them.

Until quite recently our markets were open to the world, yet potato growers managed to retain practically the whole production for themselves and have consequently been able to supply all our requirements.

Probably the greatest trouble encountered by growers in the past has been that of fitting the supply to the demand. In some years a deficit is followed by importation, and in others an excess leads to a slump in prices, resulting in many thousands of tons of potatoes rotting in the clamps for want of a market.

A serious attempt is being made by Dr. R. N. Salaman to find varieties immune to the common blight. The present position of the ravages of the eelworm is discussed by Dr. Leiper and Dr. Triffitt. No less important is the problem of finding manurial and cultivation schemes for obtaining the most economical yields. This question has been dealt with by Dr. Crowther and Mr. Garner.

Any crop produced in amounts sufficient to satisfy the annual needs of the country is bound in some seasons to yield far more than is wanted, and Dr. Woodman deals very clearly with this problem in his paper "Utilisation of Excess Potatoes on the Farm."

The conference report is of considerable interest and value to all connected with the potato-growing industry of this country, and the many problems that are discussed show the need for establishing a Potato Research Station in one of the important potato-growing areas.

(*Rothamsted Experimental Station, Harpenden, Herts. Conference Report No. XVI. "Problems of Potato Growing." 48 pages. Price 2s. Obtainable from the Secretary.*)

Pressure in Cans

By
P. Chambellan
H. Cheftel
M. L. Thuillot
R. Boudeau

PART I.

AMONG THE physical phenomena taking place during the sterilising process of canned foods, the foremost place belongs to the variations of the pressure inside the can. It is, in fact, an excess of this inside pressure which gives rise to all the dents, the flippers and the disjointed seams, which originate most of the leakages.

It is therefore most important to get thoroughly acquainted with all the intervening factors, in order to learn how to gain control of the can during canning operations. The tinplate can has not yet been superseded as a container, but, like any other tool, it has to be dealt with in a rational manner.

Firstly, we will state the theoretical principles underlying this study. Then, by taking a survey of the researches made on the same subject in other laboratories, we will review some of their practical consequences. And, lastly, we will describe the industrial applications and the various types of apparatus.

Theoretical Discussion.

In its most widespread form the can is a tinplate cylinder provided, at both ends, with a seamed closure. Before putting in place the second closure the can is more or less completely filled with the food to be preserved. But in our calculation we will suppose that the filling is done with water. It would indeed be very difficult to study each canned food separately; moreover, the coefficient of expansion of most of the canned foods will not be very different from the coefficient of expansion of water. The simplification thus introduced into our calculations will allow us to study the problem from a general point of view. The deductions, which in this way we shall be able to draw concerning the physical phenomena, will apply to all canned foods in general, and, at the same time, whichever may be the kind of product considered, we shall have completely eliminated its chemical influence, which requires separate investigation. Later, we will come back to this point in discussing some practical cases.

So our can contains water and an air-filled free space (Fig. 1). At the instant of the sealing, the pressure inside the can is equal to the atmospheric pressure, unless the can be vacuum-sealed. But as soon as the can is warmed, this inside pressure increases; firstly, on account of the pressure of the water vapour as well as of the expansion of the water itself and of the expansion of the air imprisoned in it; secondly, because the heating expands the dissolved gases, which are released. *Therefore, the final total absolute pressure will be equal to the sum of the water vapour pressure and of the partial pressures due to the released air and gases.* This pressure will evidently be a function both of the initial and of the final temperatures. If we call P_{fa} the final total absolute

The researches of H. Cheftel and his collaborators in Paris are of international repute. This series of articles is a translation of Bulletin No. 3, entitled: "La Pression intérieure dans les boîtes de conserves et ses variations pendant la sterilisation." Above is a photograph of one of the authors at work.

pressure and respectively F_f and p_f the final steam pressure and the final pressure of the dissolved air and gases, we may write

$$P_{fa}=F+p_f$$

Fig. 1.

Calculation of the Value Pf.

The gas imprisoned in the free space is air containing water vapour in a more or less large proportion, varying with the hygrometric state E. Its total pressure is equal to the atmospheric pressure. The partial pressure due to the water vapour is EF_i, if by F_i we designate the initial pressure of the water vapour. Thus, at the starting point, we shall have a volume of air, which we will call w_i, at the partial pressure

$$p_i=P_a-E.F_i,$$

where P_a stands for the atmospheric pressure.

With the increase of temperature a portion of the gases dissolved in the water is released and augments the initial air: their volume equally depends on the pressure which, together with the air, they exert on the water.

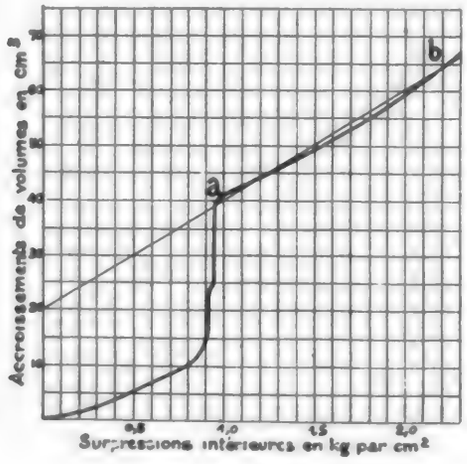


Fig. 2.

Without committing a big error, we may consider the dissolved gases as air; the coefficient of solubility of the air being s_i at the temperature t_i, the initial volume g_i of the gases will be

$$g_i=s_i.v_i,$$

v_i being the initial volume of the water.

And if s_f be the coefficient of solubility at the temperature t_f, at the end of our experiment we shall likewise have

$$g_f=s_f.v_f.$$

The coefficient of solubility does not depend on pressure and there is no need for us to know the value of p_f, in order to get the factor s_f.

Let us now bring back the volume g_f to the initial conditions of temperature and pressure; we shall have:

$$(1) \qquad (g_f)_i=v_i \frac{1+\beta t_f}{1+\beta t_i} s_f \frac{p_f}{p_i} \frac{1+\alpha t_i}{1+\alpha t_f},$$

and we shall get the volume of the released gases by taking the difference of the initial and final volumes of the dissolved air:

$$(2) \qquad v_g=g_i-(g_f)_i=v_i s_i-v_i \frac{1+\beta t_f}{1+\beta t_i} s_f \frac{p_f}{p_i} \frac{1+\alpha t_i}{1+\alpha t_f}.$$

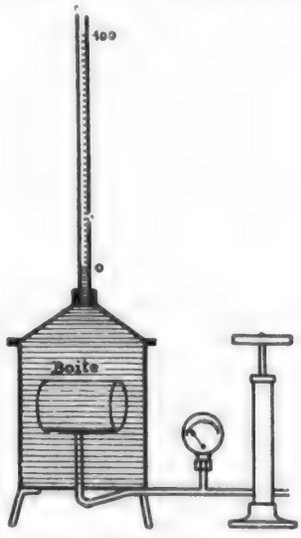


Fig. 2a.

In these equations, α is the coefficient of expansion of air and β the coefficient of expansion of water.

At the beginning we shall therefore have to consider a volume of air, having the initial partial pressure p_i, equal to

$$w_i+v_g.$$

In going over from the temperature t_i to the temperature t_f this air expands and, if its pressure remains constant, its final volume will be

$$(w_i+v_g) \frac{1+\alpha t_f}{1+\alpha t_i}.$$

By applying the law of Mariotte

$$p_1.v_1=p_2.v_2,$$

we will carry back this volume to the final pressure; let us then put in the foregoing equation

$$v_1=(w_i+v_g) \frac{1+\alpha t_f}{1+\alpha t_i},$$
$$p_1=P_a-EF_i,$$
$$v_2=w_f=V_f-v_f,$$
$$p_2=p_f,$$

V_f being the final volume of the can and v_f the final volume of the water. We shall get:

$$(3) \qquad (w_i + v_e)\,\frac{1+\alpha t_f}{1+\alpha t_i}\,(P_e - EF_i) = (V_f - v_f)p_f.$$

On the other hand, if we take into account the cubic expansion of the can, whose coefficient is Δ, and the volume increase A_c due to the bulging of the ends, the final volume V_f of the can will be:

$$V_f = V_i\,\frac{1+\Delta t_f}{1+\Delta t_i} + A_c.$$

In a similar way, v_f, the final volume of the water, will be

$$v_f = v_i\,\frac{1+\beta t_f}{1+\beta t_i},$$

β being the expansion coefficient of water.

As to the term A_c, the following diagram, drawn experimentally for a 100 mm. end, shows that between the points a and b the increase of volume due to the bulging of the end is constant. Therefore, between these points the curve may be likened to a straight line having an equation of the form

$$y = px + q,$$

which will be easy to establish.

The coefficients p and q of this equation can be determined experimentally. To this end, in order to measure the volumetric increase of a can, we proceed in the following way (Fig. 2*a*):

The can to be thus measured is placed into a watertight container into whose neck is thrust a graduated burette. The can is connected through a manometer to a pneumatic pump and, the relative pressure being zero, the container is filled with water up to the zero mark of the graduated burette.

To every increase of pressure in the can corresponds an increase in volume of the can itself, as a consequence of the bulging of the ends. This increase is read directly on the burette.

In our case (100 mm. ends) the equation becomes

$$A_c = 20\,(p_f + F_f - P_e) + 21$$

(P_e being the external pressure).

In consequence the equation (3) becomes

$$(w_i + v_e)\,(P_e - EF_i)\,\frac{1+\alpha t_f}{1+\alpha t_i} = p_f\left[V_i\,\frac{1+\Delta t_f}{1+\Delta t_i} + 20\,(p_f + F_f - P_e) + 21 - v_i\,\frac{1+\beta t_f}{1+\beta t_i}\right]$$

or else

$$20p^2_f + \left[V_i\,\frac{1+\Delta t_f}{1+\Delta t_i} + 20(F_f - P_e) + 21 - v_i + \frac{1-\beta t_f}{1+\beta t_i}\right]p_f - (w_i + v_e)\,(P_e - EF_i)\,\frac{1+\alpha t_f}{1+\alpha t_i} = 0.$$

Lastly, by substituting to the term v_e, its value given by the equation (2), we shall have

$$20p^2_f + \left[V_i\,\frac{1+\Delta t_f}{1+\Delta t_i} + 20\,(F_f - P_e) + 21 - v_i\,\frac{1+\beta t_f}{1+\beta t_i}(1 - sf)\right]p - (w_i + v_i s_i)\,(P_e - EF_i)\,\frac{1+\alpha t_f}{1+\alpha t_i} = 0.$$

The form of this equation, in which p_f appears in the second degree is identical with

$$ax^2 + bx + c = 0,$$

the solution of which is

$$x = \frac{-b \pm \sqrt{b^2 - 2ac}}{2a}.$$

In our case

$$a = 20,\quad c = -(w_i + v_i s_i)\,(P_e - EF_i)\,\frac{1+\alpha t_f}{1+\alpha t_i}.$$

The sundry factors of c are all positive, therefore the term $(-4ac)$ is also positive, which goes to show that the equation admits two distinct roots, the one positive and the other negative. The root which suits our investigation is the positive one:

$$x' = \frac{-b + \sqrt{b^2 - 4ac}}{2a}.$$

(To be continued.)

A corner of the Research Laboratories of Etablissements J. J. Carnaud, Forges de Basse-Indre, in which the work recorded in this series of articles was carried out.

Milk in Bread?

An Answer to "Ignoramus"

by Patrick J. Shortt

In the February issue "Ignoramus" made out a case against the use of milk in bread. Now Mr. Shortt, one of the greatest authorities on baking practice, makes a spirited reply.

ALL BAKERS know the people who, with no other interest to serve but their own, periodically engage the public ear with warnings of dire consequences that are sure to follow the use of white bread. They attribute to it nearly all the ills to which human flesh falls heir and loudly voice their slogan, "The whiter the bread, the sooner you're dead." Their contention is based on the fact that nearly all of the mineral salts of the wheat are removed in the process of milling, and therefore claim white flour products to be denatured and unfit for human food.

No matter how absurd is this hostile criticism and no matter from what irresponsible source it emanates, the net result is a waning public confidence in the food merits of white bread and a consequent decline in *per capita* consumption.

Many progressive bakers, acquainted with the facts and observing public food trends, wisely correct the nutritional deficiencies of their bread through the use of milk solids, and thus eliminate the chief cause of reproach and at the same time satisfy the public desire for a better bread.

Bakery research institutes, schools of baking technology, practical bakery engineers, and nutritional authorities all agree that the simplest, cheapest, and most effective way to improve the quality of bread is to introduce an adequate proportion of milk solids into its composition.

I have had my attention directed to an article appearing in a recent issue of FOOD MANUFACTURE entitled "Milk in Bread." The writer ("Ignoramus") criticised the "milk in bread" edict of Germany as a scheme to assist the farmer, without any special consideration for public health, foisting on the millers and bakers the compulsory use of milk solids without any compensating return for the additional expense and trouble. Perhaps with a desire to thwart any such humbug in this country, his zeal for the cause provoked him to discredit the value of milk in bread under any condition, in spite of the declarations of bakery scientists and nutritional authorities to the contrary.

Candidly stating that he proposed to consider, as far as his information permitted, the facts relevant and make such calculations as the facts allowed, he then presented an argument which led to the final conclusion that milk in bread is no good, no time, no how.

To let these statements, calculations, and final conclusions stand would, in my opinion, be unfair to the readers of this publication, particularly those readers interested in the subject, who may have been confused or misguided by the conclusions arrived at. So, trusting that "Ignoramus" will not be offended at any reference to him by his assumed name or will not regard my objections to his argument in any other light than a desire to clarify the issue, I will present my case in the hope of convincing all concerned, even "Ignoramus" himself, that the milk in bread idea is not such a bad one after all.

In his opening statement he says that the proposal to use dried milk in bread is advocated on several grounds—economic, dietetic, agrophile, and æsthetic. Now, in the interest of simplicity, we will discard these high-sounding terms and get right down to earth, for in all my experience I never knew of anyone who ever got very far in business through an appeal to the tender emotions of a baker.

Milk in bread is not a new proposal. For more than a quarter century it has been used in bread making on the simple and quite understandable ground that it improves every physical characteristic of the loaf—its volume, colour and texture of the crust and crumb, its freshness, toasting quality, and palatability. Incidental to these improvements, and what is considered now as of greater importance to the baking industry, the nutritional quality of the bread is so enhanced that nutritionists of international note are supporting the milk in bread idea. A leading American authority says: "Addition of milk solids replaces the mineral salts and vitamin B which are lacking in the white flour, and bread so made is therefore equal in food value, if not superior, to the ordinary whole wheat bread and is more palatable to the majority of people" (Dr. A. F. Wood, United States Department of Agriculture).

It is merely a fortuitous circumstance that the farmer may benefit through the widespread use of milk in bread. The baker himself and his customers are the principal beneficiaries, and we should not begrudge the farmer that which is his due, so let's be agrophile to that extent at least!

"Ignoramus" brings forward a number of plausible reasons why milk solids should not be used in bread. I propose to analyse each of them in turn to show the unsteady ground on which the stand is taken.

Surplus Butterfat

I.—He assumes that milk in bread is made compulsory and that it would require 300 tons of fat-free milk solids daily to lactify all the bread in the land. In this connection he says there is not enough surplus milk to provide the required tonnage of fat-free milk solids, and that if milk production was increased to meet the requirement, agronomic experts would have to decide what would become of the extra butterfat production resulting.

Let us stretch our imaginations and assume that it is made compulsory for the baker to use 12 lb. of fat-free milk solids to every sack of flour. Well, in that most unlikely event, there is enough wasted and surplus milk in England and Wales alone to provide 480,000,000 lb. of fat-free milk solids annually, or nearly twice the amount that would be required in the extreme and fanciful conditions assumed. As to the disposal of the increased output of butterfat in the forms of cream and butter, it is only necessary to point out that importations of butter in 1931 amounted to over 902,000,000 lb. and cream over 20,000,000 lb. English made butter in 1925 was only 13 per cent. of the home supply, and since then butter importations increased over 50 per cent. One does not have to be much of an agronomic expert to conjecture what would become of the relatively small increase of home-produced butter and cream.

Effect on Nutritive Values

II.—He argues that the increased daily consumption of 800,000 gallons of milk in bread would not be of much effect in bridging the appalling gap between the *per capita* consumption of milk in this country and other countries like Scandinavia. (Actually the consumption of $\frac{1}{7}$ of a pint of milk per day—the amount in a daily consumption of 8 oz. of bread—would increase the present milk consumption by nearly 50 per cent.) This line of reasoning, however, is entirely aside from the point in question and only serves to cloud the issue. As I have previously pointed out, milk in bread is not designed to promote *per capita* milk consumption or to dispose of surplus milk, but to provide a better, more palatable white bread that will tend to hold its rightful place in the family dietary, instead of being, as it now is, the football of contention as to its food merits—contention that is as harmful to the public welfare as it is to the interests of the baking industry.

III.—He advances the theory that but little benefit is derived nutritionally from the use of 12 lb. of fat-free milk solids in a 280-lb. of flour batch of bread. Now let us analyse what it really will do.

The average composition of high-grade separated milk powder is as follows: protein 37 per cent., lactose 51 per cent., minerals 8 per cent., fat 1 per cent., and moisture 3 per cent. Twelve lb. of this powder carries into the dough about 15 per cent. additional proteins, rich in important elements lacking in the flour proteins, making for a higher degree of digestibility of the bread, and over 6 lb. of milk sugar, one of the most valuable carbohydrate foods available. Unlike other forms of sugar, it is not decomposed and dissipated by yeast fermentation, but remains in the dough in a pure state. During the baking period the lactose on the surface of the loaf caramelises and imparts a rich brown colour to the crust, pleasing to the eye as well as the palate. The milk sugar is entirely available to the digestive system. Milk minerals, designed by nature to serve the purpose of building bone and tooth tissue, to purify the blood, give firmness to muscle tissue and regulate bodily processes, are introduced in such proportion as to add to the minerals of the flour 250 per cent. more potassium, 350 per cent. more calcium, 100 per cent. more phosphorus, 70 per cent. more chlorine, 50 per cent. more magnesium, 30 per cent. more sodium, and smaller percentages of other important minerals.

It is the deficiency of these minerals in white bread that constitutes the grounds for the abuse heaped on it. Milk made white bread is not only richer in assimilable minerals, but has a wider variety of these important elements than whole grain breads, so the inclusion of milk solids in the dough eliminates the chief objection to the dietary value of white bread.

Faulty Calculation

IV.—"Ignoramus" compares the calorific values of water and milk breads, and is satisfied that milk in bread is of little value because he finds only a slight increase in calories in favour of the milk bread, ignoring entirely the value of the mineral salts and vitamin increase and passing over casually the high value of the added milk proteins.

Food values are expressed not only in terms of calories, but also in terms of the biological value of the individual components of fat, proteins, carbohydrates, mineral salts, and vitamins. Besides calorie units, the body requires minerals and vitamins, and so the value of a food is proportionate to the amount and variety of assimilable elements it supplies in nutrition.

It is for these reasons, as well as because of its calorific value, that milk is regarded as the almost perfect food. It supplies rich digestible proteins, carbohydrates, fat, and minerals more nearly adapted to the needs of the body than is supplied by any other single article of diet. While it is, of course, necessary for proper diet to eat a variety of foods, it should be borne in mind that white bread made with an adequate proportion of milk solids provides, pound for pound, more of the essential elements of nutrition required, and in more assimilable form, than any other food item, not excluding milk itself.

V.—"Ignoramus" states that the use of milk solids in bread is based mainly on ideas of false economy, and that the industry is being misled into the more extensive adoption of the "milk in bread" plan.

I wonder if it is known that approximately 40,000,000 lb. of fat-free milk solids are imported here annually for sale and use, in addition to the 16,000,000 lb. produced at home—a total of 56,000,000 lb. Of this a considerable proportion is used in the baking and milling industries. Regardless of how it is sold, the consuming trades must find benefits commensurate with the cost or otherwise no sale could be effected.

A further mis-statement is that it is on the basis of extra water in the loaf that a campaign for milk bread was waged in the United States, and that attempts to encourage the sale of milk bread instead of the present water bread in the United States are alleged to have met with complete failure. These statements are so ridiculously untrue that they may be dismissed summarily.

The production of fat-free milk solids in the United States has increased, from 1916 *to* 1932, 1,558 per cent. *with a production in* 1932 *of over* 270,000,000 *lb. The baking industry is the chief consumer of the higher grade qualities, and in addition to the consumption of fat-free milk solids its use of other concentrated milks runs into hundreds of millions of pounds annually. There is practically no water bread in that country except the genuine French type of bread.*

"It Can't Be Done!"

VI.—To the proponents of milk in bread who say that an expensive campaign is unnecessary to popularise milk bread because it tastes better than water bread, "Ignoramus," who seems a bit conservative for this day and age, states: "This is a matter of taste, and it would be extremely unscientific to embark on so far-reaching a proposal with no more security than that which depends upon some men's view of other men's palates." My reply is that it would be unscientific not to continue with a plan that has definitely progressed to the complete satisfaction of bakery experts and nutritionists. We should recall to mind that our forefathers, in the dim ages of the past, ate bread made of pounded wheat and water cooked on a hot stone, and they found it good. But there came a day when a venturesome and perhaps frugal soul mixed a bit of left-over dough, that looked and smelt unpalatable, in a new mixing, and, when the bread was done, it was light and porous and much more tasty. I can imagine a conservative of that long ago day crying: "It can't be done, we cannot change our food habits." Time merged into centuries, but leavened bread remained. Again and again, change after change took place; the pounded wheat became meal, the meal became flour, then the flour was bolted to remove the bran. Other ingredients were added to the dough to make the bread more palatable. First salt, then fat, then sugar, and malt. Then came compressed yeast to replace the old ferments and make results more dependable; then came machinery to lighten the burden of bread making, and then milk, to perfect the loaf, was introduced. But at each stage of progress reactionaries stood in the path crying: "It can't be done." Progress went on nevertheless, and we now enjoy the bread of which others before us have often said, "It can't be done!"

Who Pays the Cost?

VII.—It is a generally known fact that there are certain economies resulting from the use of milk in bread. I will point out a few of these economies:

1. High-grade milk powder will absorb 1 to 1½ times its own weight of water in the dough, and it is important not to overlook that point if the best results are to be obtained.

2. In a dough in which an adequate proportion of milk powder is used there is a lesser fermentation loss, ranging between 1 to 1½ per cent. of the total dough batch.

3. The moisture retention property imparted to the bread reduces the baking loss, so that a considerable extra yield results on this point alone.

4. There is a saving in the use of fat and sugar because the milk solids perform most of the functions of these materials.

With these economy facts in mind we will now get down to the meat of the matter and determine who pays the cost of the milk solids.

It is asked, and rightly too: "Will the baker have to stand that extra expense on every 280 lb. sack of flour, or will he insist on the right to increase the price of bread and charge the extra cost to his customers?" To illustrate who pays the cost of the better bread, I will use what I am told is an average English bread formula, setting on the left the cost of the water bread and on the right the cost of the milk bread.

Formula.	*Water Bread.*		*Milk Bread.*	
	Pounds.	*Ingredient Cost.*	*Pounds.*	*Ingredient Cost.*
		s. d.		s. d.
Flour ...	280	26 0	280	26 0
Water ...	150	—	162	—
Sugar ...	2	4	—	—
Salt ...	4	2	5	2½
Fat ...	3	2 0	2	1 4
Malt ...	1	4	—	—
Milk powder	—	—	12	4 0
Yeast ...	2	1 6	2	1 6
Dough ...	442	30 4	463	33 0½
Dough cost per lb. ...	0·82353d.		0·85529d.	
Ferm. loss	2½ per cent. = 11 lb.		1½ per cent. = 7 lb.	
Net weight of dough ...	442 − 11 = 431 lb. = 6,896 oz.		463 − 7 = 456 lb. = 7,296 oz.	
Scaled at ...	36½ oz. = 189 loaves		35½ oz. = 205½ loaves	
Cost per 2-lb. loaf ...	1·92d.		1·92d.	

(*Continued on page* 187.)

THE EDIBLE FAT INDUSTRY

A Review of Recent Tendencies

By H. M. LANGTON, M.A., B.Sc., F.I.C.

THE EDIBLE fat industry is of growing importance in the civilised life of the present day. Moreover, this industry is growing in extent and importance among non-European races. The industry forms the greatest outlet for the naturally occurring fatty oils—animal, marine animal, and vegetable. Furthermore, certain oilseeds and kernels find a limited, though growing, use in several of the food industries.

Fats possess high food value, are easily absorbed and digested by the human system, and are important for their heat-producing properties. In consequence, fats and fatty oils are used not only in the uncooked state but in the cooking of meats and other groups of foodstuffs, in the baking of bread and confectionery, in pastry and cake making, in salads, etc. In addition to the foregoing uses, fatty oils are extensively used in the United States in the frying of doughnuts, the popping of corn, and in the candy industry.

The principal classes of naturally occurring fats and fatty oils which are of use in the food industries are:

Animal Fats.—Milk fats, mainly butter fat from cow's milk and ghee butter from goat's milk, the latter consumed mainly in India, are the best known. Butter, which is a solid emulsion of water in fat, on account of its consistency, plasticity, and flavour is the most perfect fat uncooked, and until the present stage of perfection had been attained in the manufacture of margarine, butter was the most preferred of all fats for the confectionery trades.

The body fats comprise lard, or hog's fat, produced principally in U.S.A.; and tallow from cattle, produced mainly in Australia, N. and S. America, and Europe. The fats which the food industries take from the edible tallow industry are premier jus, oleo stearin, and oleo oil. Mutton tallow is not used as a rule owing to its inferior keeping qualities and its somewhat undesirable taste when contrasted with the corresponding beef fats.

Vegetable Fats.—Those comprised in this group are coconut oil (from copra, the dried flesh of the coconut palm), palm oil from the fleshy part of the oil palm together with palm kernel oil from the palm nuts of the oil palm, cacao butter from the cocoa bean, and a number of other fats of less known importance whose production is confined to tropical and sub-tropical climates.

Vegetable Oils.—These are soft oils—*i.e.*, liquid at ordinary temperatures. The principal one is olive oil, which has been known from time immemorial and grown almost exclusively in countries bordering the Mediterranean littoral. Olive oil is the general utility oil for almost all domestic culinary and food purposes in the Mediterranean countries; and in the canning of fish, the production of mayonnaise, and salad oils olive oil still holds premier place. Other important oils in this group are ground nut oil, cotton seed oil after it has been suitably refined, soya bean oil after appropriate refining and deodorising, sesamé oil, almond oil, and a number of others of lesser importance.

Refining

Most of the vegetable oils and fats, which require first to be removed by solvent extraction or hydraulic expression from the seeds and kernels or fruits of which they form a part, need refining. This process consists in agitation with a warm solution of caustic soda whereby free fatty acids, albuminous matter, and the non-fatty portions of the oil are removed. Drying, bleaching, and deodorisation with superheated steam *in vacuo* complete the process.

Many factors, however, in the past contributed to throw an undue burden and responsibility on those charged with the task of refining vegetable oils and making them equal in odour and blandness of taste to the finest olive oil. Bruised or immature fruit, improperly harvested and dried seeds and kernels, coupled with lack of care in storage and transit, all tend to the production of oils of inferior quality in which there is marked development of free fatty acids, and even more objectionable by-products of the fermentative and putrefactive decomposition of fatty oils and their surrounding and associated albumin-

ous matter. The removal of these undesirable products always entails heavy losses and leads to uneconomical working. Present-day developments all aim therefore at dealing with these difficulties at the source, and consequently much attention is now given to the grading of oil seeds before planting, to the proper tending of the crops whether in fields or plantations, in careful harvesting and subsequent cleaning of the seeds, their proper storage in silos, and care in their transport to the industrial centres where the oil is subsequently to be extracted. Particularly in the case of pericarp or pulp oil, such as that of the olive and the oil palm, have these modern methods proved beneficial, but striking improvements in the quality of ground nuts and coconuts have been achieved also.

Olive Oil

The improvements in recent years in the olive oil industry have all had the object of preventing the speedy fermentation which occurs after the fruit has been plucked; this fermentation not only decreases the yield of oil, but such oil as results is often rancid and relatively high in free fatty acidity. The elimination of stalks and leaves from olives is essential for the production of oil of high quality, and the storage of olives, after gathering, in silos in which there is free circulation of air, lessens the internal heating of the stored olives and there is less fermentative change in consequence. Slightly immature olives are now known to produce the best grade of oil, and the most modern types of oil mills are now preferred in breaking the fruit and separating the oil therefrom, though if the time spent in this operation is much in excess of half an hour the quality of the oil begins to decline. The removal of the expressed oil from the associated pulp is now achieved in the most up-to-date installations by the use of a modern type of centrifuge.

Palm Oil

Still more striking changes have taken place during the post-war years in the production of palm oil, an oil produced until recently exclusively from the wild oil palm of such West African territories as Lagos, Sierra Leone, Nigeria, and Senegal. The modern exploitation of the oil palm under European supervision began in the Belgian Congo in 1911 under the auspices of Lever Brothers, and in the same year the Dutch plantations in Sumatra were inaugurated. A year or two later saw the start of similar enterprise in British Malaya. The acreage under oil palm in these areas is such that in the year which has just closed the shipments of palm oil from Sumatra were 113,260 tons, from Malaya 12,381 tons, and from Belgian Congo 55,500, or a total of upwards of 181,000 tons in contrast to a total of native West African oil from wild palms of only 150,000 tons.

The native West African methods of collecting and storing palm fruit are wasteful and costly, lead to bruising of the fruit with consequent loss of oil, and the subsequent methods of extraction—crude and costly—result in the loss of some 50 per cent. of the pericarp oil. Moreover, the oil produced contains anything from 10 to 40 per cent. and upwards of free fatty acids. In the case of plantation palm fruit, this is collected in bunches as soon as ripe, conveyed to centrally placed factories on the estates where the fruit is immediately sterilised, thus inhibiting the lipolytic fermentation of the oil in the fruit. The oil is extracted from the fruits either by modern hydraulic presses or by centrifugal extraction under European supervision, and the oil is subsequently separated from water and associated albuminous matter. Not only is the yield of oil much higher on the plantations—upwards of 80 per cent. of the oil in the pericarp being recovered—but its quality is immensely superior to that of wild palm oil, the free fatty acid content of regular commercial shipments being no more than about 3 per cent. Modern factory equipment has also been installed for drying the palm nuts after removal of the pericarp oil, for cracking these, and subsequently separating the shells from the palm kernels. In West Africa most of these operations are still conducted by hand.

Coconut Oil

The coconut palm is another oil-bearing article of commerce which has benefited by modern tendencies of production. Copra (the dried coconut meat), coconut oil (the oil from the copra), fresh coconuts, and shredded and desiccated coconut are all of importance in the edible oil and food industries, and striking developments have taken place in recent years in the cultivation of the coconut palm in plantations. Proper tending of the trees, the use of fertilisers, and the thinning out of undesirable growths have all helped to improve not only the wild coconut palms but also plantation-grown ones. In the production of copra, where sun-drying is the usual method, this has been strikingly improved where special means have been adopted to protect the copra from rain. Drying by hot air in special chambers is being introduced with beneficial results on many estates. Every effort is now made to produce white copra, of low moisture content and brittle, free from dirt, and an oil content of 65 per cent., the free acid content being less than 1 per cent. Thorough drying is perhaps the most important factor concerned in the production of good copra, as such copra is less likely to absorb moisture and therefore less liable to the development of moulds. Poor copra results in the loss of oil as well as in the development of free fatty acidity in the oil.

Ground Nut Oil

Good results have followed the care now taken in the growth and harvesting of ground nuts. More attention is now devoted to the variety of nut sown. The true Spanish variety seems generally to be best not only in the ratio of kernels to shells, but in the actual oil content of the kernels. Screening of the nuts after harvesting in order to reduce to a minimum the amount of foreign matter—*e.g.*, sand and earth—is increasingly in vogue, while greater care in stacking nuts before transit, in order to prevent development of moulds, etc., leads to improvement in the quality of the oil obtained on extraction.

Margarine, Butter, and Lard

The margarine industry is one of the largest single users of refined vegetable oils, and also of edible animal fats such as beef stearin and the like. But present-day tendencies throughout the world are leading to the production of enormous quantities of butter, for everywhere there is encouragement given to dairy farming. The production of lard is also reaching record figures. With the low prices now ruling both for butter and lard it is to be expected that the production of margarine, except the very cheapest qualities, is bound to decline somewhat in the future until some sort of balance is attained.

Hydrogenation and Whale Oil

Hydrogenation, a process in which the unsaturated glycerides of fatty oils can be caused to combine chemically with hydrogen and produce saturated glycerides—an operation somewhat analogous to changing an oil such as that of the olive into a fat of the consistency of lard or tallow—has made such strides in the past twenty or twenty-five years that fats of varying degrees of consistency and of wide range of suitability are produced in this way and made great use of in the fat industries. When it was realised that a hard white fat, of bland taste and excellent keeping qualities, could be made from whale oil, increased attention was given to the problem of improving the quality and yield of such oil. No longer is it the practice to tow the carcases of whales that have been hunted to land stations for the extraction of the oil. The modern practice is to hunt whales from what are floating factories equipped with modern steam digesting plant. Within an hour or so of a whale being caught the blubber has been stripped from the carcase and is in the extractors. This improved technique results to-day in an average yield of 75 barrels of oil per whale as against an average of only 25 barrels less than twenty years ago. As the oil is now extracted before decomposition of the flesh of the animal has begun, whale oil as now produced is free from nitrogenous decomposition products of albuminous matter, and is therefore without the objectionable odour and taste formerly associated with such oil, and the free fatty acidity is no more than 1 to 2 per cent. in respect of 90 per cent. or more of the oil, whereas before the introduction of present-day methods, not more than 60 per cent. of the oil from a catch was of such high grade quality.

A West Indian Plantation Scene.

Refined Oils and Fats

In this article T. G. Joyce, B.Sc., F.I.C., raises some controversial points concerning which criticisms will be published in the next issue.

THE TERM "refined" when applied to fats and fatty oils has a very doubtful significance. The word really means "purified." If, when used in connection with an oil or fat, it truthfully certified the purity of the product, no objection could be taken. When, however, it is applied to one that has become stale, and which has been subjected to processes to remove objectionable features, it is misleading.

The condition of the sample before any attempt at purification is made, and the method adopted, are all-important. It is the double usage of the word in these connections that deprives it of its value.

It is noticeable that although the word "refined" occurs at the end of the definition of olive oil in the 1914 edition of the British Pharmacopœia, it is omitted from that of 1932. It would seem to have legitimate use when it implies that a pure oil or fat has been produced from a natural crude product by freeing it from impurities such as moisture and tissue, unavoidably associated with it in the expression of a vegetable oil, or the rendering of an animal fat. When, however, it is applied to products obtained by various processes from oils or fats which, though originally pure, have become more or less altered by age, exposure, or other circumstance, the justification of its use is very questionable.

Commercial users hope to obtain a product equal in every respect to the pure article when the word "refined" is included in the description.

It is permissible to clarify, by settling and filtering, oils freshly expressed from fruits and seeds; and where a non-freezing oil, such as cod liver oil, is required, filtering at a low temperature is demanded.

By such methods, when due care is taken, an oil may be obtained free from foreign substances and of the recognised standard for such oil.

Attempts have been, and still are being, made to restore old, altered oils and fats to their original condition, but so far without success. Products of decomposition are removed and substances, apparently temporarily improved, result. It does not require a minute examination, however, to detect the difference in colour, taste, and smell from those of the pure articles. If not already rancid, they soon become so. It has also been proved that they have probably lost any vitamin potency they originally possessed.

To explain these failures, it is necessary to realise the exact difference between a pure natural oil or fat and one that has been subjected to the process of so-called refining.

Pure oils and fats are composed of a mixture of glycerides in varying proportions, and constituting approximately 98 per cent. of the whole. The remaining approximately 2 per cent. is unsaponifiable matter. Pure fresh oils are free from rancidity; old and badly stored ones are more or less rancid. A rancid oil is one in which a gradual decomposition of unstable glycerides has taken place by hydrolysis, oxidation, and so forth. These changes are characterised by an increase in acidity, a darker colour, and a peculiar odour.

Attempts at "refining" such rancid oils and fats are confined to the removal of the products of decomposition. There is no necessity here to go into the details of the many and varied processes that have been tried and exploited to this end. It will suffice to mention the main features:

(1) Neutralisation by means of alkali and removal of soap formed.

(2) Decolorisation. (*a*) Chemical. This obviously produces a product too much altered to be of value. (*b*) Mechanical. Removal of colour by charcoal, fuller's earth, or other suitable absorbent.

(3) Deodorisation. Volatilisation by heat in open pan or *in vacuo*, or by steam distillation. Also to a certain extent by absorption during mechanical bleaching process.

These processes fail because they do not discriminate between acquired and natural characteristics. Consequently, both are removed or modified at the same time.

Natural colour and odour are so intimately connected with antioxidant and vitamin activity that their removal seriously affects keeping quality and any medicinal value there might be.

These processes lay themselves open to criticism from another point of view. In none of them is it possible entirely to exclude air from the material under treatment. By working under reduced pressure, the amount of oxygen in intimate contact with the oil may be brought to a minimum, but the necessary agitation of the oil provides conditions for a maximum action of any oxygen present. The chemical actions that take place are also facilitated

by any increase of temperature during the treatment. It is true that old degradation products may be removed, but the new products formed are particularly unstable. They may be pleasing to the eye but in most cases they have a peculiar sharp odour. This odour has been attributed to the particular absorbent employed. It appears more probable, however, that it arises from recently formed decomposition products, possibly catalysed by the absorbent itself. In short, the refining of a previously decomposed oil is incapable of restoring it to its original state. It has lost either by oxidation or by absorption during the process any quality that was attributable to the unsaponifiable portion.

It appears evident, therefore, that no process at present known is able to regenerate a good oil from a bad one. Rather should means be sought for improving existing methods of storage, so that a pure oil shall not deteriorate but shall retain its condition for a much longer time than it does at present.

In storing oils and fats it has to be remembered, and it cannot be emphasised too much, that one is dealing with unstable compounds that, when a chance be given, will decompose.

It has long been known that they can be expected to remain sound for only a limited time, and that in order to delay change they should be kept dry and cool and protected from light. In addition, they should not be exposed to air more than is absolutely necessary.

More recently, scientific explanations have been forthcoming, and better methods of storing are being constantly investigated. Bottles containing oils should be as nearly full as possible and fitted with airtight stoppers. Solid fats should be tightly wrapped in greaseproof paper. Attempts have been made to replace air in containers with a neutral gas such as nitrogen or carbon dioxide. The difficulty, however, of completely removing the air, increased by that dissolved in the oil, has so far made this impracticable. Consequently, protection from light and freedom from impurities, organic and inorganic, that are capable of catalysing any of the processes of decomposition are all-important.

A point that is receiving attention is the question of antioxygens. A large amount of work remains to be done before a reliable one can be found suitable for edible oils and fats.

With regard to the colour of the package, investigations are also being conducted. Black excludes all light, though not very artistic, and dark amber coloured bottles have hitherto been advocated for storing unstable liquids. Recent experiments, however, suggest that a particular shade of green is more effective in shutting out the rays that assist decomposition of oils.

It is gratifying to learn that Triebold, Webb, and Rudy are making a careful study of antioxygens, and Coe and LeClerc of light action and rancidity. Further and detailed reports from these sources are awaited with interest.*

* Reports of work on antioxygens and action of light are published in the March, 1934, issue of *Industrial and Engineering Chemistry*.—Ed.

Typical French Packs.

Industrial News

MONEL METAL — EAST MALLING — CENTRIFUGALS — PULVERISERS — TORTOISES — AIR CONDITIONING — WRAPPING MACHINES — BRITISH OIL ENGINES

Monel Metal

The illustration below shows a typical installation of Monel metal food service equipment. In many large hotels and on numerous ships in the mercantile marine of different nations the metal has been extensively employed for the flat surfaces on which the food is prepared, as well as for a wide variety of special equipment, in hotels, restaurants, cafeterias, soda fountains, clubs, bars, etc. The main advantages are its attractive silvery colour, ease of cleaning, resistance to denting and scratching, resistance to corrosion by food acids, etc., freedom from any plating or coating. This means cleanliness, low upkeep costs, and a long life. Monel metal has been used for more than twenty years for high quality food service equipment, so that it has been thoroughly tested under practical conditions. The metal may be easily cleaned in normal service, since alkalis do not affect it. Abrasive cleaners are generally recommended and may be employed with perfect safety.

Here is a photograph of Professor Joseph Pérard, president of the executive committee of the III^e^ Congrès International Technique et Chimique des Industries Agricoles, held in Paris in March and concerning which an account will be found on another page of the present issue. He is a professor at the Central School of Arts and Manufactures, and vice-president of the Association of Sugar and Fermentation Chemists.

East Malling

The Duke of York will be present at the coming-of-age celebration of East Malling Research Station on Empire Day, May 24.

Readers will recollect that the scientific work conducted at East Malling has been of tremendous benefit to growers of fruit at home and in the Empire overseas. In connection with this work a ship's hold equipped with instruments has been built in the laboratory, enabling tests to be made on the storage of apples under any desired conditions of temperature, humidity, air circulation, and so on. The importance of this kind of work may be gauged from the fact that £250,000 was lost by the trade in one season by a lack of information in connection with the transport of apples from the Antipodes.

Gas storage of apples has been brought to such a high standard at East Malling that home-grown can now be stored from one harvest to the next, assuring English apple supplies the year round in such a

Snack Bar Equipment at the "Hungary Man" Hotel, Birmingham.

Courtesy of Messrs. L. Lumley and Co

condition that it is difficult to distinguish them from the fresh-gathered.

Another important branch of the East Malling experiments is the investigation of the degeneration of strawberries. East Malling works in co-operation with similar stations, colleges, and other institutions in various parts of the Empire.

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Magnetic Clutch

An interesting and useful new type of clutch suitable for power transmission to almost every class of machinery is made by Thomas Broadbent and Sons, Ltd., of Huddersfield. Among the outstanding features one might mention that the friction lining can be renewed without disturbing the clutch position and can be readily adjusted to take up wear. Also, the clutch, which is extraordinarily powerful, can be instantaneously switched on.

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Centrifugals

Thomas Broadbent and Sons, Ltd., are best known for their centrifugals, which cover practically every purpose for which such machines are required. For seventy years they have been supplied to almost every important user throughout Great Britain and abroad, and during this time every possible improvement has been introduced to render them perfect in every detail. Full particulars of these machines are given in an attractive booklet recently issued by this firm. A wide range of types is covered, such as direct electrically and also separately driven machines, as well as those which are driven by belt, water, and steam. The photographs of these types are really excellent and the data appertaining to them are more clearly and tastefully arranged than is the case with most trade publications. Useful additions are tables of centrifugal data and other facts and figures required by the engineer. Messrs. Broadbent invite you to take advantage of the services offered by their highly trained technical staff and their research and experimental department.

This is a photograph of Henry François-Dupont, the General Secretary of the Congress, whose enthusiasm is largely responsible for its existence. He is Avocat à la Cour de Paris, Avocat Conseil du Ministère de l'Agriculture, and vice-president of the Association of Chemists.

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Changes

Nutrient, Limited, are now at Adelaide House, London Bridge, King William Street, E.C. 4, instead of Mark Lane Station Buildings, E.C. 3. New telephone number, Mansion House 0067; telegrams, Nutrient, Bilgate, London; cables, Nutrient, London.

The new address of the Hercules Powder Co. in Holland is Korte Vijverberg 5, The Hague, Holland.

Messrs. Spicers, Ltd., have changed their telephone number to Central 4211 (18 lines).

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The Paris Fair

The Paris International Trade Fair will be held from May 9 to 24. The estimated number of exhibitors is 8,000. Thirty years ago there were only 497 exhibitors. Foods appear among the list of products to be shown.

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Pulverisers

This is the emblem—so to speak—adopted by International Pulverisers, Ltd., manufacturers of the Pulmac Mill for grinding foodstuffs or other products to any degree of fineness ranging from coarse granules to an impalpable powder.

W. J. Bush and Co. Ltd.

Messrs. W. J. Bush and Co., Ltd., of 28, Ash Grove, Hackney, London, E. 8, inform us that they have secured the services of Mr. Dixon Kitts, Crampton Court, Dame Street, Dublin, as their agent and representative in the Irish Free State. Mr. Kitts will carry stocks of certain of the company's products and thus will be able to make prompt deliveries and give efficient service. Mr. Kitts succeeds Mr. R. S. Donald in the Irish Free State, Mr. Donald having relinquished the territory in order to travel more extensively in the United Kingdom.

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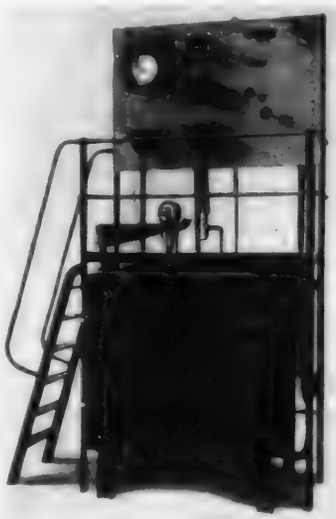
Retorts for Food Processing

A horizontal type of retort fitted with control panel is illustrated here. This is made by G. A. Harvey and Co. (London), Ltd. It is fitted with easily operated swing doors hung on davit and swing bolts. Loading is effected by means of wheeled bogies which are very shallow to allow a maximum space for the canned goods. This firm also makes the vertical type of retort. Messrs. G. A. Harvey are well known for a variety of other equipment, such as screens, tanks, gilled tubes, distillation plant, and vacuum drying plant.



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Tortoises

We should be interested to know if tortoise flesh is used to any extent for edible purposes in this country, and, if so, just for what purposes and from what sources supplies are being obtained.

Conference on Air Conditioning

The arrangements made at the Queen's Hotel, Leeds, for this conference and exhibition were extremely well carried out, save perhaps that its success was greater than anticipated and the attendance was so good that freedom of movement and of breathing were somewhat limited.

The actual exhibition can be divided into two main sections:

(i) Apparatus for the humidification of the air and

(ii) Temperature and humidity recording instruments and automatic control devices.

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Conditioning Methods

The commercial plant in use for air conditioning seems to be of two main types:

A central station method, in which the bulk of the incoming air is drawn by a fan through a heavy spray of water, so that it becomes saturated with water vapour at the temperature of the water. Temperature of the spraying water is under control. This conditioned air is then blown through ducts into all departments of the building, where it is released into the atmosphere through slots or orifices. In this method the air is washed and the air velocity can be controlled.

A small unit method, in which small air pressure jets, throwing a fine mist of water vapour into the atmosphere, are placed at various points throughout the building. This involves two pipe lines, supplying the water and compressed air for producing the mist. Sometimes artificial means of circulating the air are used. Good regulation of humidity and temperature control is claimed for this method.

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Wrapping Machines

The difficulties of wrapping and sealing a package with transparent cellulose to ensure its being absolutely airtight and moistureproof are only too well known. Yet this can now be done mechanically at the rate of 15 to 200 wrapped packages per minute, depending on the size of packets, by the Molins Wrapping Machine made by Molins Machine Co., Ltd., of London. It is claimed that every joint is positively sealed by means of an adhesive which ensures perfect tightness. Their action is entirely automatic. Various models are available.

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Printer Parcelling Machines

The same firm makes a range of machines which package and print in one operation. An additional unit can be incorporated which automatically coats the inner surface of the wrapper with wax. The packages can be fed either from stacks or travelling bands, or the parcelling machine can be linked up with the existing packing machinery, making a continuous operation. The wrapping material can be kraft, glascine, waxed paper, cellulose wrapping, or similar material and can be printed in one colour as it passes through the machine. Further, positive sealing at all joints and folds can be obtained if desired.

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Dewey and Almy Honoured

Our congratulations to Dewey and Almy, Ltd., manufacturers of Darex and Gold Seal Products.

We learn that the Metropolitan Life Insurance Co. of New York has selected 47 companies in U.S.A. for study in connection with their bulletin on "The Control of Industrial Research," and that Dewey and Almy Chemical Company, of Cambridge, Mass., have been honoured by inclusion in the list.

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British Oil Engines

Messrs. Crossley Brothers, Ltd., Manchester, and their associated company, The Premier Gas Engine Co., Ltd., Nottingham, have received during the past month orders that exceed 11,000 brake horse power and come from almost every corner of the world.

A repeat order comes from an Australian gold mine for five Crossley-Premier Horizontal Diesels totalling 3,500 brake horse power, bringing the oil engine installation at the mine up to eleven engines aggregating 7,700 brake horse power, and all Crossley-Premier!

Many of the world's best mines are worked by Crossley-Premier engines, and at the Lake View and Star Gold Mine, Australia, the saving in working costs as compared with the previous bought-out electric current is £84,000 per annum.

Cooking Operations in French Preserving Factory.

INFORMATION and ADVICE

Maleic Acid — Sausage—Glaze for Hams — Jelly Crystals—Banana Flour—Marsh Spots in Peas — Jelly — Frozen and Dried Eggs — Cheese Sandwich Spread—Cheap Pickle— Dog Biscuits—Colouring Cheese—Aluminium Cans—Cream Cheese—Candied Peel—Soups —Piccalilli—Tomato Chutney—Kola Nuts

Maleic Acid

1,563. *On page* 184 *of* FOOD MANUFACTURE *for June, 1933, you state that maleic acid is a cheap and easily produced synthetic compound. Can you describe the process of manufacture? Is it soluble in oil?* (London.)

Maleic acid is now produced commercially in U.S.A. by the vapour phase catalytic oxidation of benzene. It is also produced in small quantities as a by-product of the catalytic oxidation of naphthalene to phthalic anhydride. Its solubility in fats and oils is only 0·01 per cent., which simplifies its use as an antioxidant for preventing the development of rancidity in fats and oils on storage, since excess acid may be added to the oil and then removed by filtration. It adds no taste, odour, or colour to the product. It has also been found to inhibit development of rancidity in milk powder, pastry and caramels. We have been in communication with Dr. Greenbank, of the U.S. Department of Agriculture, who has been responsible for the introduction of maleic acid as a rancidity inhibitor, and he has furnished full information, which will be summarised in FOOD MANUFACTURE.

Sausage

1,564. *Kindly suggest recipe for sausage suitable for London trade.* (Midlands.)

This is a matter for a practical sausage maker. Some valuable hints can be picked up from Mr. Gerrard's articles on sausage making now running in *Food Industries Weekly*. How would the following meet your requirements?

Good Class Sausage.

Lean pork	4 lb.
Back fat	2 ,,
Rusks	2 ,,
Water	2¾ ,,
Salt	2 oz.
White ground pepper	½ lb.
Mace	½ oz.
Ginger	¼ ,,
Ground sage	¼ ,,

Pass meat through a mincer. Then pass through bowl chopper. Add the seasoning, fat, and binder soaked in water.

Cheap Sausage.

Lean pork	4 lb.
Fat	2 ,,
Ground rice	4 ,,
Seasoning	2 oz.

Glaze for Hams

1,565. *We should be greatly obliged if you could favour us with any information on a glaze for ham dipping.* (London.)

The following may provide a basis for developing a glaze to meet your special requirements. A gelatin dip for smoked meats is made as follows:

Edible gelatin	25 parts
Glucose	35 ,,
Water	40 ,,

Place the gelatin and glucose in a jacketed pan and mix, having the temperature of the water in the jacket a little higher than lukewarm. Then add the water to the gelatin and glucose, mix well, and raise the temperature gradually to not less than 130° F. and not over 150° F. Cook for 1½ to 2 hours.

Wipe each piece of smoked meat carefully to remove surplus grease, salt, etc., then dip into the glaze momentarily. If necessary, the pieces may be dipped a second time. Then let them hang over the kettle so that any drip may be recovered. This will give a transparent, resilient, and amply tough covering to resist damage in reasonable handling. The meats may then be wrapped and shipped in the usual way.

There is also a glaze for sausage and meat loaves; the glaze may be made as follows:

Gelatin	2½ lb.
Sugar	2 ,,

Jelly Crystals

1,566. *We are repeatedly being asked for jelly crystals. We understand these are mixtures of sugar, gelatin, citric acid, colour, and essence. Can you supply a formula?* (Lancashire.)

Reference should be made to back issues of this journal. The information required has been published several times.

Banana Flour

1,567. *As a regular subscriber to* FOOD MANUFACTURE *you have been able to assist me before, and I write therefore with some confidence again.*

A friend of mine is anxious to know where he can obtain supplies of banana flour. I am unable to say anything about the quantities wanted, but as he wishes to get in touch with importers I gather that he proposes distributing the same. This, of course, is assumption from the letter he writes me.

Can you give me any information as to where banana flour can be obtained, with possibly a rough idea of the price? (Glasgow.)

The enquirer was put in touch with possible sources of supply.

This question of the uses of banana flour has been fully discussed in a previous issue of FOOD MANUFACTURE. The attempts which have been made from time to time to find an outlet for this commodity have hitherto not been very successful. This, however, should not deter further efforts being made. Personally, I believe that proper investigation would open up several new fields of use. The main difficulty, as with soya flour, seems to lie in the acrid taste of the flour. It does not seem to be an impossible task to find a way of either removing or masking this defect—not as difficult as in the case of soya flour. Probably the usual method of drying would have to be modified. As a matter of fact, investigations are actually in progress with a view to developing new uses, such as in health and patent foods, for an improved form of banana flour.

Marsh Spots in Peas

1,568. *Can you inform me if canners experience any trouble from "marsh spots" in peas? Is it a common infection in seed supplied to canners?* (England.)

1. There appears to be no evidence that canners have encountered high percentages of marsh spots in peas grown for them. If marsh spot is only found on ripe peas, it would hardly be of economic significance to the fresh pea canners, as the peas are picked while still slightly immature. Dried peas which are used for canning are always hand-picked before being supplied to the canner, and any diseased peas would be removed during the hand-picking operation. I do not believe any complaints have been received from the public regarding the finding of marsh spotted peas.

2. Marsh spot does not appear to be a common infection in seed supplied to canners by the seedsmen. Peas grown for seed are also picked over by hand and a percentage guarantee of germination is generally given by the supplier. Marsh spot does not affect the canning industry to any extent. It may, however, be a source of loss to the farmer who grows peas for the dried pea trade. I think perhaps Mr. Wallace of the Kirton Agricultural Institute may have some information in this connection.

Jelly

1,569. *I have been making some jelly from skins which has become white. Can you tell me how to clarify this and make it quite bright?* (SCOTLAND.)

The skins, bones, tendons, and other meat waste should be digested with steam in a retort. Then run into tanks or tubs for cooling and allow to stand until the solid matter, including any lime, has deposited. Decant off the jelly portion from the top into a steam-pan. Clarify with blood albumen which has stood in cold water overnight without being stirred. Next day this is added, while stirring, to the jelly stock. Then gradually bring the mixture to nearly boiling point, cut off steam, and stand for 15 to 20 minutes. Thoroughly skim and pass through filter bags or press.

Frozen and Dried Eggs

1,570. *We have been recommended by the Superintendent of the Food Investigation Research Station, Cambridge, to enquire of you as to a few details that we are desirous of obtaining—viz., If you can inform us of the method of preparation as carried out in China of frozen, dried, preserved liquid eggs; also the process of precipitation of albumen in liquid state, prior to drying same in crystal form, and the type of machine so used, and, if possible, names of the manufacturers of machines used in China.* (London.)

Your questions cover a very wide field and cannot be dealt with in the way of ordinary correspondence.

Your best plan is to refer to the article we published on the subject in our December, 1933, issue, and from this you will get a general idea of the practice followed.

It is, however, as you will realise, essentially a matter for reference to a chemical engineer who specialises in this kind of work and who can supply you with reliable plant and who will be able to put you right with regard to the latest practice and give you all the information you require as to the kind of plant that is necessary.

You will realise that the choice of plant is one on which I cannot advise you, as it is very largely dependent on your particular circumstances, details of which you have not stated in your letter. If there is any other specific point on which you would like advice I should be only too glad to give you assistance.

Cheese Sandwich Spread

1,571. *Could you help me in perfecting a cheese sandwich spread? I am experimenting along the lines of grinding cheese to a paste and flavouring the paste by blending with tomato purée or ketchup, but am doubtful about its keeping properties owing to moisture content.* (Midlands.)

Why not leave out the tomato purée? If you want a tomato flour in your spread, use dried tomato powder. I would suggest that you shred the cheese and mix in the mustard, butter, salt, and salad cream. First of all, mix the cheese with the mustard and salt, and then mix in the butter and salad cream. Pass all through a fine mincing machine and then fill into dry containers. The amounts

of mustard, etc., to be added to the cheese will, of course, be readily determined by trial. It is really a matter of developing a flavour according to your particular requirements.

Cayenne could also be used as another ingredient. Another idea is to use about equal proportions of German sausage and cheese.

A Cheap Pickle

1,572. *Could you supply us with a good recipe for a cheap pickle in which we could use up our cauliflower stalks?* (North Shields.)

Detailed directions were supplied. Stated in general terms, the process consists in preparing a sweet spiced pickle and filling it, together with a little oil of cassia, into casks of cauliflower, bastards, and No. 2 onions. Allow to stand for 48 hours. Place 2 lb. gum tragacanth in a tub containing 2 gal. water. Stand overnight and then stir well.

Place 200 lb. cauliflower stumps in a steam-pan with enough water to cover them. Gently simmer for an hour or so. Then pass them through a pulping machine fitted with a fine sieve into a steam-pan.

Rub the gum through a fine sieve into a steam-pan. Add 10 gal. of the cauliflower pulp, together with a mixture of tomato purée, white sugar, chopped garlic, white pepper, ground ginger, and cayenne.

Stir well and turn on the steam. When near boiling point, colour to give a nice red tint. Boil gently for about 15 minutes. Pass through a fine sieve and allow to become cold.

Place the cauliflowers, bastards, and onions on a draining table and cut them up. Mix well and drain overnight. Next day, half-fill the glass jars with the sauce and then fill them up with the vegetables.

Better class pickles of this type are made by cutting up straight sweet pickled vegetables and packing them in tomato sauce.

Dog Biscuits

1,573. *Will you kindly let us have recipes for dog biscuits to use up waste meat products?* (England.)

This is too large a subject to be dealt with here, and will be answered in the form of a forthcoming article.

Colouring Cheese

1,574. *Will you please supply some information on the colouring of cheese?* (London.)

The colouring used for cheese is a vegetable dye known as annatto. It is prepared for butter so that only the fat is coloured, and for cheese so that colour is distributed through the whole of the milk. It is therefore necessary to purchase supplies of annatto according to the purpose for which it is intended.

The colouring for Cheshire cheese is added in the proportion of 1 dram of colouring to 6 or 8 gal. of milk—varied to give the colour required for the market. It should be added and well mixed with milk in the cheese vat after the morning milk has been received and as long before renneting as possible, so that the colouring is evenly distributed.

Aluminium Cans

1,575. *I should appreciate any information you can supply relative to the suitability of aluminium cans for sardine packing.* (England.)

I think one could pretty safely state that there are no firms in this country packing sardines in aluminium cans. In Norway, however, sardines are being so packed (particulars of firm and brand were given the enquirer).

The plant required for pressing out these cans is the ordinary type—this aspect of the work you will be fully acquainted with.

If you want to see actual specimens of cans, and obtain more information about the methods of manufacture, you might get in touch with the British Aluminium Company, Ltd.

As regards suitability, this question has been very fully investigated during the last four or five years by Dr. Lunde and his associates at the Research Laboratory at Stavanger, Norway.

Here is a summary of some of the results that have been achieved: Lunde, Aschehoug, Breien, and Wulfert, of the Research Laboratory of the Norwegian Canning Industry, published in June, 1933, their results of feeding experiments with canned goods packed in aluminium cans. They report that 99·5 per cent. pure aluminium is well suited as packing material for sardines, kippered herring, fresh herring, and fish balls, and also for crab, lobster, and shrimp. They have also determined the amount of aluminium present in these foodstuffs packed in aluminium cans after a storage period as long as three years. They have concluded that the small quantities of aluminium which were present in such canned foods have no detrimental effect whatever on the organism.

Cream Cheese

1,576. *We make cream cheese from perfectly fresh cream, renneted, and allowed approximately 12 hours to drain, with constant scraping. The cheese, however, will not keep for more than about a week. I hear of a cream cheese guaranteed to keep fresh for three weeks. How is this done?* (Yorkshire.)

I do not know of any method of making cream cheese which will enable it to keep fresh for three weeks. The keeping quality normally will depend on that of the milk from which the cream is obtained. Clean milk, a sterile separator, and pasteurised cream will give the foundations for a cream cheese of good keeping quality. General cleanliness in manufacture and low temperature of storage will help. But I know of no legal method by which a *cream* cheese can be guaranteed to keep fresh for three weeks. A week is considered good by an expert at the National Institute for Research in Dairying, at Shinfield, Reading.

If you would give the name and, if possible, a sample of the cheese "guaranteed to keep fresh for three weeks" one might be able to help you a little further.

Candied Peel

1,577. *We should be obliged if you could tell us how to make candied peel.* (Hull.)

An article on this subject was published in our August, 1932, issue.

Soups

1,578. *In your "Information and Advice" pages of the March issue of* FOOD MANUFACTURE *you were kind enough to supply enquirer No.* 1,545 *with the recipe for tomato and other soups. We are interested in the canning of these and, as we are subscribers to your paper, we should be obliged if you would send us the said recipe.* (Hants.)

The following recipe for a good class tomato soup may serve as a basis, although in actual practice it is always best to carry out your own trials, as the choice of ingredients varies very largely on the question of cost, and also on the class of soup and the particular conditions and taste of the public for whom you are catering:

Tomato purée	18 gal.
Onions, peeled and chopped fine ..	18 lb.
Garlic	18 oz.
Beef dripping	9 lb.
Beef extract	7½ lb.
Beef stock	7½ lb.
Cornflour	13 lb.
Salt, Sugar, Ground ginger, White pepper	to taste
Water	10 gal.
Colouring matter	to suit

(Examples of quantities of salt, sugar, ginger, and pepper were given to the enquirer.)

If it is cream of tomato soup you are making, then 12 gal. of milk should be used. If, however, you are only making tomato soup, you omit the milk.

Simmer the onions, garlic, dripping, and water in a pan for an hour, adding boiling water to maintain the original volume. Add the beef extract and stock and then boil. Pass through a pulping machine and return to pan. Add the purée, ginger, salt, sugar, and pepper, and simmer for five minutes. Make the cornflour into a paste with 5 gal. of cold water and stir well into the soup. Add milk and bring to boil. Make up to total volume of 39 gal. with boiling water. Fill hot into cans and sterilise.

Piccalilli

1,579. *Could you give me any idea of the methods of manufacturing piccalilli?* (Lisbon.)

You could not do better than refer to the article which appeared in our June, 1932, issue for recipes and methods.

Tomato Chutney

1,580. *We duly received your letter of the 31st ultimo, for which we thank you.*

Therein you have a note on the manufacture of tomato chutney, advising us to use 80 per cent. acetic acid, 70 lb. canned tomatoes, 25 lb. onions, 28 lb. sugar, 5 lb. salt, 1 lb. gum tragacanth, and 4 gal. water.

We shall be pleased if you will kindly give us the complete recipe you recommend—i.e., including spices, etc.—together with complete instructions for making. Could tomato purée be used instead of canned tomatoes, and should the chutney be bottled and capped while it is still hot?

We enclose copies of the recipes we have been using for tomato sauce and tomato chutney, and we shall be glad to have your remarks on these. We have found a certain amount of fermentation in the sauce after it has been bottled. Our method of filling this is: The sauce is drawn hot from the boiler into wooden vats and allowed to cool. When cold the vats are drained into a large tinned hopper, under which the bottles are passed and filled.

We should be pleased if you could tell us what causes the fermentation, and how this can be avoided. (Scotland.)

It seems to me that you are making the mistake of not filling the tomato chutney into the bottles when in a hot condition. The chutney should be bottled at not less than 180° F. and immediately capped.

As regards the tomato sauce, sterilisation is really essential in order to guard against the possibility of fermentation. The sauce may be directly bottled, capped, and sterilised, or it may be run hot into sterile barrels and bottled when required. After sterilisation, the bottles are brought up to 195° F. in an hour, and kept at this temperature for fifteen minutes. There is no reason why you should not use tomato purée in the chutney.

You could take:

Apple pulp	40 lb.
Tomato purée	30 ,,
Seeded and finely chopped raisins	14 ,,
Sultanas	5 ,,
Finely chopped preserved ginger ..	10 ,,
Lemons, chopped fine	2 ,,
Sugar	28 ,,
Salt	5 ,,
Gum tragacanth	1 ,,
Eighty per cent. acetic acid ..	24 oz.
Water	4 gal.
White pepper and oil of pimento to flavour.	

Boil gently for about 15 minutes. Bottle at not less than 180° F.

Kola Nuts

1,581. *One of our customers abroad has just asked us the way in which to use kola nuts in the manufacture of chocolate and confectionery in general.*

We would feel obliged if you could let us have the requested information, telling us eventually whether this is obtainable in pamphlet or book form, and if so, where published. (London.)

The enquirer was put in touch with sources of information on this subject.

THE BRAZILIAN CITRUS INDUSTRY

BRAZILIAN citrus fruit has appeared on the United Kingdom and Continental markets in increasing quantities since 1927. It is the most serious competitor of the South African citrus industry, coming as it does on the above markets at the same time as South African fruit.

In view of this acute competition the South African Co-operative Citrus Exchange, who control a large proportion of the South African citrus export crop, recently sent their technical adviser to investigate the Brazilian citrus industry. A detailed report of this investigation has now been published.

It is concluded that Brazil possesses great possibilities for the production of large quantities of good quality citrus fruit. Only two, or perhaps three states, however, need consideration from the export point of view. The citrus industry in the states of Sao Paulo and Rio de Janeiro is most important, being very concentrated and near the principal ports of shipment.

Many of the older plantations, due to close planting, very humid conditions, and cultural malpractices, are showing signs of rapid deterioration. On the other hand, new plantings are taking place on a large scale and under better conditions.

Climatic conditions on the whole are well suited to the production of citrus. No irrigation is practised at the present time, although, despite the heavy rainfall, it would often be advantageous.

The principal export varieties are the Navel, Seedling, and Pera. Considerable new plantings of grapefruit are being made, particularly in the coastal districts.

Fertilisation is rarely met with, but is likely to need attention in the future.

Much investigational work is required in pest and disease control. The average grower has so far made very little effort to combat pests and diseases. Fortunately, as in Florida, entomogenous fungi play an important rôle in the natural control of insect pests.

The Brazilian producer can produce citrus more cheaply than his South African contemporary, although his costs in respect of pest and disease control, and to some extent fertilisation, will increase in the near future. At the present time Brazilian citrus fruit can be landed overseas at less per box than South African fruit.

It is considered that future plantings will largely depend upon the average prices received for citrus fruit on the overseas markets. The next few years will probably not see any exceptional increase in exports, because so many plantings are in poor condition and most of the young trees are not yet in production.

Apart from many natural advantages enjoyed by the Brazilian citrus grower, the industry is still faced with the danger of over-production, lack of co-operation and the proper control, and development of overseas markets.

G. R. B.

MILK IN BREAD?

(*Continued from page 174.*)

On the assumption that a 2-lb. loaf will yield 3½d. to the baker, the 189 loaves of water bread return 661d. The 205½ loaves of milk bread at the same price return 719d., the difference in favour of milk bread being 58d. But the milk dough cost 32d. more than the water dough, so according to this method of calculating costs the baker would be 2s. 2d. ahead on each sack of flour baked with milk.

In reality, as the above table indicates, the improved loaf has cost the baker nothing; so if he charges that to his customers no one can complain.

It is unwise for the baker to rest content in the belief that the public food habits are unchangeable, as "Ignoramus" would lead him to believe, for we all know that those habits are yielding to the multitudinous variety of cereal foods appearing on the market, all bidding for the space in the public stomach now held by bread. It is far wiser to be awake to this situation and to realise the fact that milk bread holds its freshness longer, tastes better, toasts better, looks better, and is irreproachable nutritionally, which means popular appreciation of the excellence of white bread as a food and its accompanying influence on increased consumption.

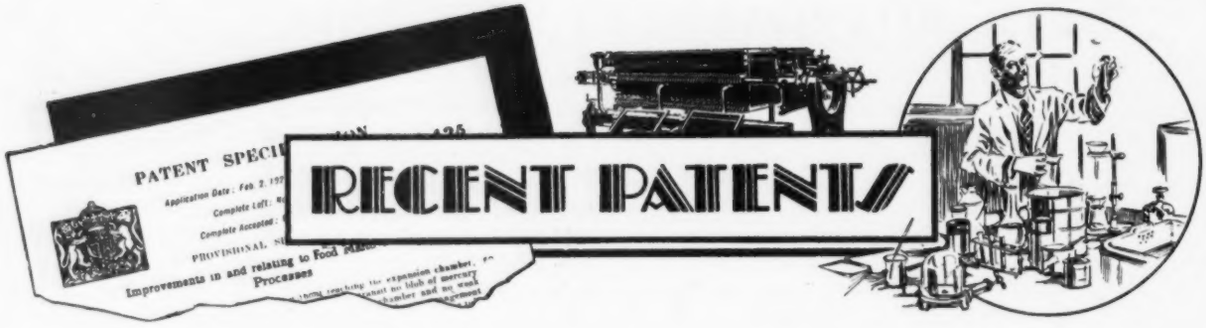
RECENT PATENTS

(*Continued from next page.*)

milk, soya bean meal, alfalfa, and flavouring agent. A trace of medicament may also be included in the recipe. Small particles of toasted cereal which accumulate in the manufacture of cereal foods for human beings are a convenient source of supply. Vitamins B^1 and B^2 (the latter sometimes described as G) are supplied by the dried yeast, which also functions as a vitamin D source if previously irradiated with ultra-violet light. A special plant for converting the food into biscuit form is described and illustrated.

405,906. **Emulsified fat solvents.** W. H. WILCKEN. Convention date, Germany, December 5, 1932.

Carrageen moss, agar-agar, and like materials are made up into a jelly with water acidified with a very small percentage of a suitable organic or inorganic acid and incorporated with a fat solvent such as benzine. The resulting emulsion can be diluted with water in any desired proportion. According to an example, a mucilage obtained from 6 kilograms dried carrageen moss and 82 kilograms water is centrifuged and well mixed with 3 per cent. or more of oxalic acid prior to forming an emulsion with the fat solvent. Emulsions of this type are claimed to be suitable for complete extraction of fat from flesh, fish meal, etc., the fat being recoverable in the pure state. When intended for rendering products like meat or fish meals, which are subsequently used for fodder, it is advisable to use phosphoric acid in place of oxalic acid.



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Latest Patent Applications

7111. Aktiebolaget Transitoria: Preserving - cans, etc. (Sweden, March 3, 1933.)

6879. Allen, H. E., and McCaleb, A. G.: Coloration and condimentation of foodstuffs.

7320. Allgauer Alpenmilch Akt.-Ges.: Manufacture of milk for infants. (Germany, March 7, 1933.)

7321. Allgauer Alpenmilch Akt.-Ges.: Production of sugar. (Germany, July 25, 1933.)

7297. Speas Manufacturing Co.: Preparations for making food products.

6828 and 6829. R. Feix: Manufacture of cheese. (Germany, January 20.)

6572. Harrington, J.: Carton-waxing machines.

6943. McKenna Brass and Manufacturing Co., Inc.: Bottling carbonated beverages.

7807. I.G. Farbenindustrie Akt.-Ges.: Protective envelopes of paper, etc., for containing food. (Germany, March 11, 1933.)

7986. Soc. de Credits Internationaux Soc. Anon.: Production of food.

8035. Neale, H. A.: Preparation of coffee extracts.

7552. Nyrop, A.: Extracting fats and oils from animal and vegetable material.

8050. Schweizer, A.: Decolorisation of crystal sugar. (Holland, April 1, 1933.)

7809. Sussmuth, K. W.: Manufacture of moulded sugar bodies. (Germany, March 13, 1933.)

7392. Weizmann, C.: Yeast preparations.

8167. Bottomley, F.: Confectionery and manufacture thereof.

8491. British Arkady Co., Ltd., and Callow, R. H.: Yeast nutrients.

8791. Deutsche Starke-Verkaufsgenossenschaft Eingetragene Gen.: Preparation of dry product from glucose syrup.

8170. Elias, O. A.: Manufacture of mineral water, etc.

8210. Hinrichs, W. J. H.: Preservation of fruit.

8175. Isinglass Manufacturers, Ltd., and Jackson, H. E.: Preparation, etc., of materials for making jellies.

9733. Axlerod, A.: Manufacture of milk products.

9653. Continental Can Co., Inc.: Manufacture of cereal beverage products.

9049. Flemming, G. M.: Delaying souring of milk.

8972. Food Machinery (M. and P.), Ltd.: Machines for cooking and cooling canned goods.

9384. Hasselberg, L. J. R.: Apparatus for cooling and aerating milk.

9562. Loose-Wiles Biscuit Co.: Method of making food products.

Complete Specifications Accepted

406,731. Amesbury, A. H., Powell, A. W., and Fry and Sons, Ltd., J. S.: Moulds for chocolate and like substances.

406,881. Stelling, F. R.: Method of and machine for the manufacture of bonbons.

406,650. Shaw, E. Metcalfe-: Cooling tables or slabs for cooling sugar and other viscous liquids.

406,983. Lister and Co., Ltd., R. A., and Cummings, G. M.: Pressure-relieving devices for milk or other liquid coolers or closed cisterns.

407,044. Barker and Dobson, Ltd., and Roberts, H. R.: Manufacture of sweetmeats. (Addition to 373,473.)

407,213. Tres Gyogyszer-vegyeszeti Ipari Es Kereskedelmi Reszvenytarsasag: Process of improving flours or dough prepared therefrom for the manufacture of foodstuffs. (Addition to 385,796.)

407,248. Naamlooze Vennootschap Algemeene Beleggings Maatschappij: Chocolate.

407,443. Lunt, W. R. F.: Heat-insulated container for storing perishable commodities and closing means therefor.

407,461. Hanseatische Mühlenwerke Akt.-Ges.: Production of cheese.

407,526. Navrotzky, N. De: Recovery of alcohol from bread-baking ovens.

407,672. Schlor, F.: Process and apparatus for the sterilised filling of liquids, more especially beverages like beer, fruit juices, and the like, into glass bottles having a suitable closure.

407,728. Nygaard, J. O.: Preservation of animal raw materials.

407,729. Nygaard, J. O.: Process for obtaining oil from sea animals and oil-rich fish.

407,743. Aluminium Plant and Vessel Co., Ltd., and French, T. E.: Method of and apparatus for removing gases from milk or cream or other liquids.

407,866. Neufeld and Co., M.: Process of producing soya flour.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Published Abstracts

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per group volume, or in bound volumes price 2s. each.

405,283. **Animal foods.** Yeasties Products, Inc. Convention date, United States, October 29, 1931.

A balanced foodstuff on a toasted cereal basis for dogs and other animals is made up of toasted cereal (62 per cent.), meat (15 per cent.), yeast (5 per cent.), together with salt, bonemeal, butter

(*Continued on previous page.*)